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During his college education, his extra-curricular activities helped him stay ahead of the crowd. Playing chess was his hobby and his participation in various chess competition won him various acclaims. He also cleared National Olympiad in Mathematics. His business plans were very much appreciated by TIE, a global network of entrepreneurs.

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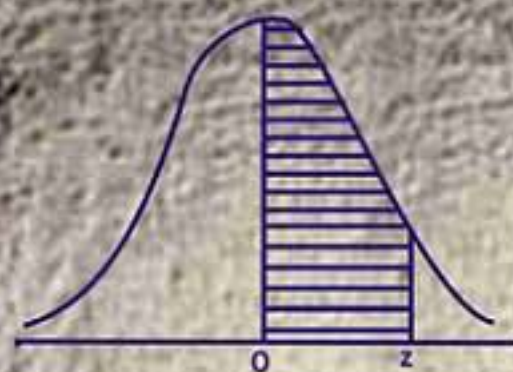
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ADVANCE MANAGEMENT ACCOUNTING CA. PARAG GUPTA

ADVANCE MANAGEMENT ACCOUNTING FOR CA FINAL NEW COURSE

Updated till
June'09
Examination

Material Usage
Variance =
[Standard Qty. for
Actual Output
- Actual Qty. Used] x
Standard Rate



CA. PARAG GUPTA



*To my family,
who always stood beside me in every phase of my life.
Love You!*



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June 2009-New Course Question Paper

Question No. 1 is compulsory
Answer any **five** questions from the rest
Working notes should form part of the answer

Marks

- 1(a) XYZ Ltd. has two divisions, A and B. Division A makes and sells products A, which can be sold outside as well as be used by B. A has a limitation on production capacity, that only 1,200 units can pass through its machining operations in one month. On an average, about 10% of the units that A produces are defective. It may be assumed that out of each lot that A supplies, 10% are defectives.

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When A sells in the outside market, the defectives are not returned, since the transportation costs make it uneconomical for the customer. Instead, A's customers sell the defectives in the outside market at a discount.

But when B buys product A, it has to fix it into its product, which is reputed for its quality. Therefore, B returns all the defective units to A. A can manually rework the defectives, incurring only variable labour cost and sell them outside at Rs. 150 and not having to incur any selling costs on reworked units. If A chooses not to rework, it can only scrap the material at Rs. 30 per unit. B can buy product A from outside at Rs. 200 per unit, but has to incur Rs. 10 per unit, as variables transport cost. B can insist to its outside suppliers also that it will accept only good units.

A incurs a variable selling overhead only on units (other than reworked units) sold outside. The following figures are given for the month :

Variable cost of production-Dept. A (Rs./unit)	120
Variable selling overhead (Rs./u)	20
Selling price per unit in the outside market (Rs./u)	200
Current selling price to B (Rs./u)	190
Additional variable labour cost of reworking defectives (Rs./u)	100
Selling price of reworked defectives (Rs./u)	150
Fixed costs for the month (Rs.)	36,000
Maximum demand from B at present (no. of units)	630

The e outside demand can be freely had upto 900 units.

Given the demand and supply conditions, you are required to present appropriate calculations for the following :

(i) Evaluation of the best strategy for A in the present condition.

(ii) If B can buy only upto 540 units and the outside demand is only 600 units, how much should A charge B to maintain the same level of profit, as in (i) above?

- (b) PQ Ltd. makes and sells a labour-intensive product. Its labour force has a learning rate of 80%, applicable only to direct labour and not to variable overhead.

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The cost per unit of the first product is as follows:

Direct materials	10000
Direct labours	8000 (@Rs. 4 per hour)
Variable overheads	<u>2000</u>
Total variable cost	20000

PQ Ltd. has received an order from X Ltd. for 4 units of the product. Another customer, Y Ltd. is also interested in purchasing 4 units of the product. PQ Ltd. has the capacity to fulfill both the orders. Y Ltd. presently purchases this product in the market for Rs. 17,200 and is willing to pay this price per unit of PQ's product. But X Ltd. lets PQ choose one of the following options :

(i) A price of Rs. 16,500 per unit for the 4 units it proposes to takes from PQ.

Or

(ii) Supply X Ltd.'s idle labour force to PQ, for only 4 units of production, with PQ having to pay only Re. 1 per labour hour to X Ltd.'s workers. X Ltd.'s workers will be withdrawn after the first 4 units are produced. In this case, PQ need not use its labour for producing X Ltd.'s requirement. X Ltd. assures PQ that its labour force also has a learning rate of 80%. In this option, X. Ltd. offers to buy the product from PQ at only Rs. 14,000 per unit.

X and Y shall not know of each other's offer.

If both orders came before any work started, what is the best option that PQ may choose?

Present suitable calculations in favour of your argument.

- 2(a) Ret Ltd., a retail store buys computers from Comp Ltd. and sells them in retail. Comp Ltd. pays Ret Ltd. a commission of 10% on the selling price at which Ret sells to the

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outside market. This commission is paid at the end of the month in which Ret Ltd. submits a bill for the commission. Ret Ltd. sells the computers to its customers at its store at Rs. 30,000 per piece. Comp Ltd. has a policy of not taking back computers once despatched from its factory. Comp Ltd. sells a minimum of 100 computers to its Customers.

Comp Ltd. charges prices to Ret Ltd. as follows :

Rs. 29,000 per unit, for order quantity 100 units to 140 units.

Rs. 26,000 per unit, for the entire order, if the quantity is 141 to 200 units. Ret Ltd. cannot order less than 100 or more than 200 units from Comp Ltd.

Due to the economic recession, Ret Ltd. will be forced to offer as a free gift, a digital camera costing; it Rs. 4,500 per piece, which is compatible with the computer. These cameras are sold by another Co., Photo Ltd. only in boxes, where each box contains 50 units. Ret Ltd. can order the cameras only in boxes and these cameras cannot be sold without the computer.

In its own store, Ret Ltd. can sell 110 units of the computer. At another far-off location, Ret Ltd. can sell upto 80 units of the computer (along with its free camera), provided it is willing to spend Rs. 5,000 per unit on shipping costs. In this market also, the selling price that each unit will fetch is Rs. 30,000 per unit.

You are required to :

(i) State what is Ret's best strategy along with supporting calculations.

(ii) Compute the break-even point in units, considering only the above costs.

3

(b) What are the various formulae used in calculating budget ratios?

3(a) The CEO of your company has been given the following statement showing the results for a recent month :

Particulars	Master Budget	Actual
Units produced & sold	10,000	9,000
	Rs.	Rs.
Sales	8,00,000	7,00,000
Direct material	2,00,000	1,84,000
Direct wages	3,00,000	2,62,000
Variable overhead	1,00,000	94,000
Fixed overhead	1,00,000	98,000
Total Cost	7,00,000	6,38,000
Net Surplus	1,00,000	62,000

The standard cost of the product is as follows:

Direct material (1kg @ Rs. 20/kg) Rs. 20.00 per unit

Direct wages (1 hour @ Rs. 30/hour) Rs. 30.00 per unit

Variable overhead (1 hour @ Rs. 10/hour) Rs. 10.00 per unit

Actual results for the month revealed that 9,800 kg. of material was used and 8,800 labour hours were recorded.

Prepare a flexible budget for the month and compare with the actual results

6

Calculate material volume and variable overhead efficiency variances.

2

(b) What is disinvestment strategy? Highlight the main reasons for disinvestment.

4

(c) What is uniform costing? Why is it recommended?

4

4(a) The cost per unit of transporting goods from factories X, Y, Z to destinations A, B and C, and the quantities demanded and supplied are tabulated below. As the company is working out the optimum logistics, the Govt. has announced a fall in oil prices. The revised unit costs are exactly half the costs given in the table. You are required to evaluate the minimum transportation cost.

6

Factories\Destinations	A	B	C	Supply
X	15	9	6	10
Y	21	12	6	10
Z	6	18	9	10
Demand	10	10	10	30

(b) Give an appropriate cost unit for each of the following service sectors :

4

(i) Hotel

(ii) School

(iii) Hospital

(iv) Accounting firm

(v) Transport

(vi) Staff Canteen

(vii) Machine maintenance
(viii) Computer Department.

- (c) A factory manager contends that the mean operating life of light bulbs of his factory is 4,200 hours. A customer disagrees and says it is less. 6

The mean operating life for a random sample of 9 bulbs is 4,000 hours, with a sample standard deviation of 201 hours.

Test the hypothesis of the factory manager, given that the critical value of the test statistic as per the table is (-) 2.896.

- 5(a) Bearings Ltd. makes three products, A, B and C in Divisions A, B and C respectively. The following information is given : 12

	A	B	C	
Direct Materials (excluding material A for Divisions B and C)	4	15	20	Rs./u
Direct labour	2	3	4	Rs./u
Variable overhead	1	1	1	Rs./u
Selling price to outside customers	15	40	50	Rs./u
Existing Capacity	5,000	2,500	2,500	(No. of units)
Maximum External demand	3,750	5,000	4,000	(No. of units)
Additional fixed costs that would be incurred to install additional capacity	24,000	6,000	18,750	Rs.
Maximum Additional units that can be produced by additional capacity	5,000	1,250	2,250	(No. of units)

B and C need material A as their input. Material A is available outside at Rs. 15 per unit. Division A supplies the material free from defects. Each unit of B and C requires one unit of A as the input material.

If B purchases from outside, it has to pay Rs. 15 per unit. If B purchases from A, it has to incur in addition to the transfer price, Rs. 2 per unit as variable cost to modify it.

B has sufficient idle capacity to inspect its inputs without additional costs.

If C gets material from A, it can use it directly, but if it gets material from outside, which is at Rs. 15, it has to do one of the following :

(i) Inspect it at its own shop Boor at Rs. 3 per unit.

Or

(ii) Get the supplier to supply inspected products and pay the supplier Rs. 2 p.u. as inspection charges.

Or

(iii) A has enough idle labour, which it can lend to C to inspect at Re. 1 p.u. even though C purchases from outside.

A has to fix a uniform transfer price for both B and C. The transfer price will not be known to outsiders and is at the discretion of the Divisional Managers.

What is the best strategy for each division and the company as a whole?

- (b) Explain the following in the context of a network : 4

(i) Critical path

(ii) Dummy activity.

- 6(a) Formulate the dual for the following linear program: 6

Maximize: $100x_1 + 90x_2 + 40x_3 + 60x_4$

Subject to, $6x_1 + 4x_2 + 8x_3 + 4x_4 \leq 140$

$10x_1 + 10x_2 + 2x_3 + 6x_4 \leq 120$

$10x_1 + 12x_2 + 6x_3 + 2x_4 \leq 50$

$x_1, x_2, x_3, x_4 \geq 0$;

(Only formulation is required. Please do not solve.)

- (b) Name the various methods of fitting a straight line to a time series and briefly explain any two of them. 5

- (c) Traditional Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows: 5

Particulars	Product A	Product B	Product C
Direct materials	50	40	40 Rs. /u
Direct labour @ Rs. 10 Rs./hour	30	40	50 Rs. /u
Production overheads	30	40	50 Rs. /u
Total Cost	110	120	140 Rs. /u

June 2009-Old Course Question Paper

Question No. 1 is compulsory
Answer any four questions from the rest
Working notes should form part of the answer

Marks

- 1(a) TQM Limited makes engines for motor cars for its parent company and for two other motor car manufacturers. 11

On 31st December, the company has sufficient work order for January and one further order for 21,000 engines. Due to recession in the economy, no further order are expected until May when it is hoped economic prospect for the motor car industry will have improved. Recently factory has been working at only 75% of full capacity and the order for 21000 engines represents about one month production at this level of activity.

The board of directors are currently considering following two options :

(i) Complete the order in February and close the factory in March and April.

OR

(ii) Operate at 25 per cent of full capacity for each of three months of February, March and April.

The costs per month at different levels of activities are as follows:

	At 75% (Rs.)	At 25% (Rs.)	Idle(Rs.)
Direct material	5,25,000	1,75,000	-
Direct labour	5,23,600	1,73,250	-
Factory overhead:			
Indirect material	8,400	4,900	4,900
Indirect labour	1,01,500	59,500	-
Indirect expenses:			
Repair & maintenance	28,000	28,000	-
Office overhead:			
Staff salaries	1,48,400	98,000	67,550
Other overheads	28,000	19,950	11,200

Other information is as follows:

— Material cost and labour cost will not be incurred where there is no production.

— On the reopening of the factory, one time cost of training and engagement of new personnel would be R. 65,800 and overhauling cost of plant would be Rs. 14,000.

— Parent company can purchase engines from open market at reasonable price.

Required:

(i) To express your opinion, along with calculations, as to whether the plant should be shut down during the month of March and April or operate 25% of full capacity for three months.

(ii) To list and comment on cost and non-costs factors which might be relevant to the discussion.

- (b) The following are Product Nova Shaft's data for next year budget: 9

Activity	Cost Driver	Cost Driver volume/year	Cost pool
Purchasing	Purchase orders	1500	Rs. 75000
Setting	Batches produced	2800	Rs. 112000
Materials handling	Materials movements	8000	Rs. 96000
Inspection	Batches produced	2800	Rs. 70000
Machining costs	Machine hours	50000	Rs. 150000
Purchase orders	25		
Output	15000 units		
Production batch size	100 units		
Materials movement per batch	6		
Machine hours per unit	0.1		

Required:

(i) Calculate the budgeted overhead costs using activity based costing principles.

(ii) Calculate the budgeted overhead Costs using absorption costing (absorb overhead using machine hours).

(iii) How can the company reduce the ABC for Product Nova Shaft?

- (c) Explain goals and performance measure for each perspective of Balance Score Card. 4

- 2(a) A company is organized on decentralized lines, with each manufacturing division operating as a 12

separate profit centre. Each division manager has full authority to decide on sale of division's output to outsiders or to other divisions. Division AB manufactures a single standardised product. Some output is sold externally and remaining is transferred to division XY where it is a sub-assembly in the manufacture of the division product. The unit cost of division AB product and division XY is as follows:

	Division AB (Rs.)	Division XY (Rs.)
Transfer from division AB to XY	-	42.00
Direct material	6.00	35.00
Direct labour	3.00	4.50
Direct expenses	3.00	-
Variable manufacturing overheads	3.00	18.00
Fixed manufacturing overheads	6.00	18.00
Variable selling and packing expenses	3.00	2.50
	<u>24.0</u>	<u>120.00</u>

Division AB sold 40,000 units annually at the standard price of Rs. 45 in external market. In additions to the external sales, 10,000 units are transferred annually to division XY at internal price of Rupees 42 per unit. Variable selling and packing expenses are not incurred by supplying division for the internal transfer of the product. Division XY incorporates the transferred goods into more advance product. The manager of division XY disagrees with the basis used to set the transfer price. He argues that transfer price should be made at variable cost since he claims that his division is taking output that division AB should be unable to sell at price Rs. 45.

He also submitted a report of the relationship between selling price and demand to support of his disagreement. The report of customer demand at various selling prices for division AB and for division XY is as follows :

Division AB			
Selling price per unit (Rs.)	30	45	60
Demand (Units)	60,000	40,000	20,000
Division XY			
Selling price per unit (Rs.)	120	135	150
Demand (Units)	15,000	10,000	5,000

The company has sufficient capacity to meet demand at various selling prices. Internal transfer demanded units will be decided by XY division.

Required:

- To calculate divisional profitability and overall profitability of company if division AB transfers demanded units to XY at price of Rs. 42.
- To calculate divisional profitability and overall profitability of company if division AB transfers demanded units to XY at variable cost.
- In place of internal transfers, AB division can sell 10000 units of their product in new external market without effecting existing market, at price Rs. 32 per unit and XY division can purchase these units at the rate of Rs. 31 in open market. Calculate company's profit by following above strategies.

- Define the term 'value-chain'. Mention three useful strategic frameworks of the value-chain analysis. 4
- Meena is a news reporter and feature writer for an economic daily. Her assignment is to develop a feature article on 'Product Life-cycle Costing', including interviews with the Chief Financial Officers (CFO) and operating managers. Meena has been given a liberal budget for travel so as to research into company's history, operations, and market analysis for the firm she selects for the article. 3

Required :

- Meena has asked you to recommend industries and firms that would be good candidates for the article. What would you advice? Explain your recommendations.

- JBC Limited, a manufacturing company having a capacity of 60,000 units has prepared a following cost sheet: 9

Direct material per unit)	Rs. 12.50
Direct wages (per unit.)	Rs. 5.00
Semi-variable cost	Rs. 30,000 fixed plus 0.50 per unit

Factory overhead (per unit)	Rs. 10.00 (50% fixed)
Selling and administration overhead (per unit)	Rs. 8.00 (25% variable)
Selling price (per unit)	Rs. 40

During the year 2008, the sales volume achieved by the company was 50,000 units.

The company has launched an expansion program as under:

- (a) The capacity will be increased to 1,00,000 units.
 - (b) The cost of investment on expansion is Rs. 5 lakhs which is proposed to be financed through financial institution at 12 per cent. per annum.
 - (c) The depreciation rate on new investment is 10 per cent based on straight line.
 - (d) The additional fixed overheads will amount to Rs. 2.00 lakhs up to 80,000 units and will increase by Rs. 80,000 more beyond 80,000 units.
- After the expansion, the company has two alternatives for operating the expanded plant as under:
- (i) Sales can be increased up to 80,000 units by spending Rs. 50,000 on special advertisement campaign to explore new market.
 - (ii) Sales can be increased up to 1,00,000 units subject to the following:
 - (a) Reduction of selling price by Rs. 4 per unit on all the units sold.
 - (b) The direct material cost would go down by 4 per cent due to discount on bulk buying.
 - (c) By increasing the variable selling and administration expenses by 4 per cent.

Required:

- (i) Construct a flexible budget at the level 50,000 units, 80,000 units and 1,00,000 units of production and select best profitable level of operation.
- (ii) Calculate break even point both before and after expansion.
- (b) State major reason for using simulation technique to solve a problem and also describe basic steps in a general simulation process. 5
- (c) What is penetrating pricing? What are the circumstances in which this policy can be adopted? 7
- 4(a) A project with normal duration and cost along with crash duration and cost for each activity is given below: 12

Activity	Normal		Crash	
	Time (Hours)	Cost (Rs.)	Time (Hours)	Cost (Rs.)
1-2	5	200	4	300
2-3	5	30	5	30
2-4	9	320	7	480
2-5	12	620	10	710
3-5	6	150	5	200
4-5	0	0	0	0
5-6	8	220	6	310
6-7	6	300	5	370

Indirect costs are Rs. 50 per hour.

- (a) Draw the network and identify the critical path.
- (b) Find out total float associated with each activity.
- (c) Crash the relevant activities systematically and determine the optimum project completion time and cost.
- (b) A factory is going to modify a plant layout to install four new machines M₁, M₂, M₃ and M₄. There are 5 vacant places J, K, L, M and N available. Because of limited space machine M₂ cannot be placed at L and M₃ cannot be placed at J. The cost of locating machine to place in Rupees is shown below: 7

	J	K	L	M	(Rs.) N
M ₁	18	22	30	20	22
M ₂	24	18	-	20	18
M ₃	-	22	28	22	14
M ₄	28	16	24	14	16

Determine the optimal assignment schedule in such a manner that the total costs are kept at a minimum.

- 5(a) Global Limited uses standard and marginal costing system. It provides the following details for the year 2007-08 relating to its production, cost and sales: (in Rs.) 9

Particulars	Budget	Actual
-------------	--------	--------

Sales units	24000	25600
Sales value	<u>6000</u>	<u>6784</u>
Materials	960	1080
Labour	1440	1664
Variable overheads	<u>2400</u>	<u>2592</u>
Total Variable cost	4800	5336

The sales budget is based on the expectation of the company's estimate of market share of 12%. The entire industry's sales of the same product for the year 2007-08 is 2,40,000 units.

Further details are as follows:

Particulars	Standard	(in Rs.) Actual
Material price per kg.	8.00	7.50
Labour rate per hour	6.00	6.40

You are required to:

- (a) Prepare a statement reconciling the budgeted contribution with actual contribution on the basis of important material variances, labour variances, variable overhead variances and sales variances.
- (b) Compute market size variance and market share variance.
- (b) Fairbilt Furniture Ltd. manufactures three products: Tables, Chairs and Cabinets. The company is in the process of finalizing the plans for the coming year; hence the executives thought it would be prudent to have a look at the product-wise performance during the current year. The following information is furnished:

	Tables	Chairs	Cabinets
Unit selling price	80	60	16 ^{Note}
Direct material	28	24	16
Direct labour	20	12	12
Factory overheads:			
Variable	8	6	4
Fixed	8	6	1.28
Cost of production	64	48	33.28
Selling, distribution and general administration expenses:			
Variable	4	2	2
Fixed	4	6	1.52
Unit cost(I)	72	56	36.80
Unit profit (loss) (II)	8	4	(0.80)
Sales volume (units)	10000	15000	15000
Profit (loss)	80000	60000	(12000)

For the coming period, the selling prices and the cost of three products are expected to remain unchanged. There will be an increase in the sales of tables by 1,000 units and the increase in sales of cabinets is expected to be 8,000 units. The sales of chairs will remain to be unchanged. Sufficient additional capacity exists to enable the increased demands to be met without incurring additional fixed costs. Some among the executives contend that it will be unwise to go for additional production and sale of cabinets, since it is already making losses at Rs. 0.80 per unit. The suggestion is that cabinets should be eliminated altogether.

Do you agree? Substantiate with necessary analysis and determine the product-wise and overall profits for the coming year.

- 6(a) What do you mean by back-flushing in JIT system? What are the problems that must be corrected before it will work properly? 5
- (b) Explain the main characteristics of Service sector costing. 5
- (c) X is a multiple product manufacturer. One product line consists of motors and the company produces three different models. X is currently considering a proposal from a supplier who wants to sell the company blades for the motors line. 9

The company currently produces all the blades it requires. In order to meet customer's needs, X currently produces three different blades for each motor model (nine different blades). The supplier would charge Rs. 25 per blade, regardless of blade type. For the next year X has projected the costs of its own blade production as follows (based on projected volume of 10,000 units):

Direct materials	Rs. 75,000
Direct labour	65,000
Variable overhead	55,000

Fixed overhead:	-
Factory supervision	35,000
Other fixed cost	<u>65,000</u>
Total production costs	<u>2,95,000</u>

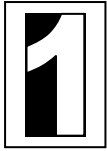
Assume (1) the equipment utilized to produce the blades has no alternative use and no market value, (2) the space occupied by blade production will remain idle if the company purchases rather than makes the blades, and (3) factory supervision costs reflect the salary of a production supervisor who would be dismissed from the firm if blade production ceased.

(i) Determine the net profit or loss of purchasing (rather than manufacturing) the blades required for motor production in the next year.

(ii) Determine the level of motor production where X would be indifferent between buying and producing the blades. If the future volume level were predicted to decrease, would that influence the decision?

(iii) For this part only, assume that the space presently occupied by blade production could be leased to another firm for Rs. 45,000 per year. How would this affect the make or buy decision?

Note There seems some error in question paper. It should be 36 in spite of 16.



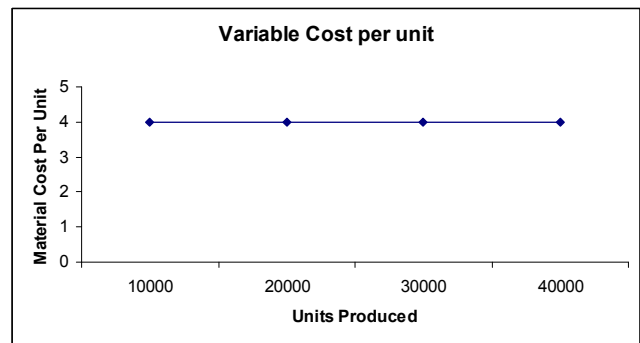
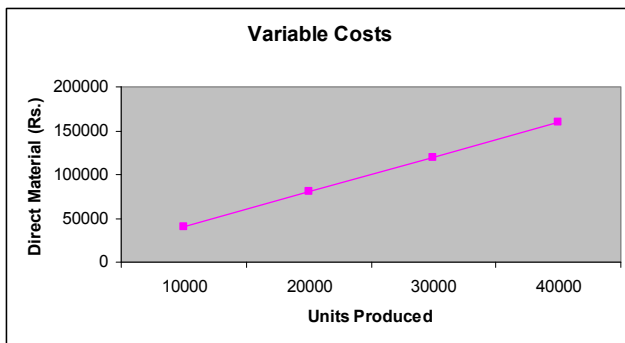
CVP Analysis

COST BEHAVIOR

THE NATURE OF COSTS: Before one can begin to understand how a business is going to perform over time and with shifts in volume, it is imperative to first consider the cost structure of the business. This requires drilling down into the specific types of costs that are to be incurred and trying to understand their unique attributes.

VARIABLE COSTS: Variable costs will vary in direct proportion to changes in the level of an activity. For example, direct material, direct labor, sales commissions, fuel cost for a trucking company, and so on, may be expected to increase with each additional unit of output.

<u>Units</u>	<u>Direct Material (Rs.)</u>	<u>Cost per unit(Rs.)</u>
10000	40000	4
20000	80000	4
30000	120000	4
40000	160000	4



FIXED COSTS: The opposite of variable costs are fixed costs. Fixed costs do not fluctuate with changes in the level of activity. Examples include administrative salaries, rents, property taxes, security, networking infrastructure support, and so forth. Observe that the fixed cost *per unit* will decline with increases in production. This attribute of fixed costs is important to consider in assessing the scalability of a business proposition.

Types of fixed costs: For planning purposes, fixed costs can be viewed as either committed or discretionary.

Committed fixed costs - Relate the investment in facilities, equipment & basic organizational structure. They have two key characteristics:

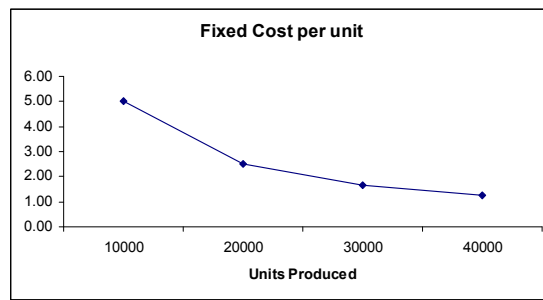
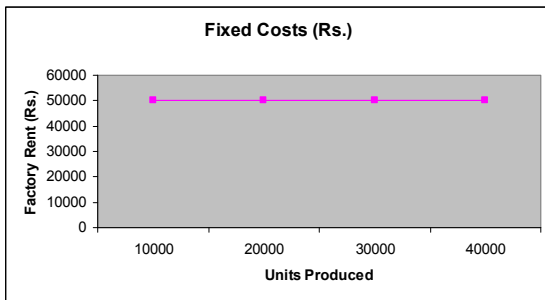
- ☐ They are long term
- ☐ They can't be significantly reduced even for short periods of time without seriously impairing the profitability or long run goals of the organization

Discretionary fixed costs - Usually arise from annual decisions by management to spend in certain fixed cost areas. Examples are: Advertising, R & D, Public relations, Management development programs, Internships for students.

Two key differences exist between discretionary & committed fixed costs:

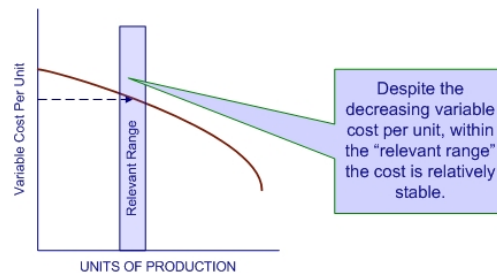
- ☐ The planning horizon for discretionary fixed costs is short term.
- ☐ Discretionary fixed costs can be cut for short periods of time with minimal damage to the long run goals or the organization.

<u>Units</u>	<u>Factory Rent (Rs.)</u>	<u>Rent per unit(Rs.)</u>
10000	50000	5.00
20000	50000	2.50
30000	50000	1.67
40000	50000	1.25



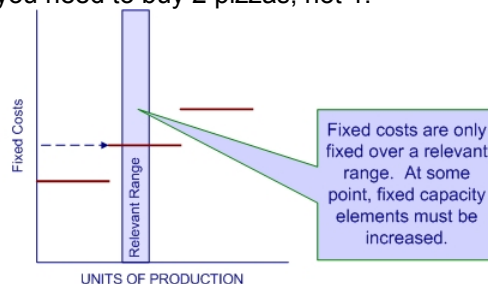
RELEVANT RANGE

The "relevant range" is the anticipated activity level at which you will perform. Any pricing data outside of this range is irrelevant and need not be considered. This enhanced concept of variable cost is portrayed in the following graphic:



Cost behavior often changes outside of the relevant range of activity due to a change in the fixed costs. When volume increases to a certain point, more fixed costs will have to be added. When volume shrinks significantly, some fixed costs could be eliminated. Fixed costs that behave in this fashion are also called **step costs**.

For example, you are buying frozen pizza in a box from the grocery store. One pizza can feed 3 guys. Step-fixed cost is the cost of the pizza, it is sold by the box, and there is no partial pizza to be sold. The relevant range is the 3 guys, once it's more than 3; it goes up to the next level->need another box of pizza. When you have 4 guys waiting to eat pizza, you need to buy 2 pizzas, not 1.



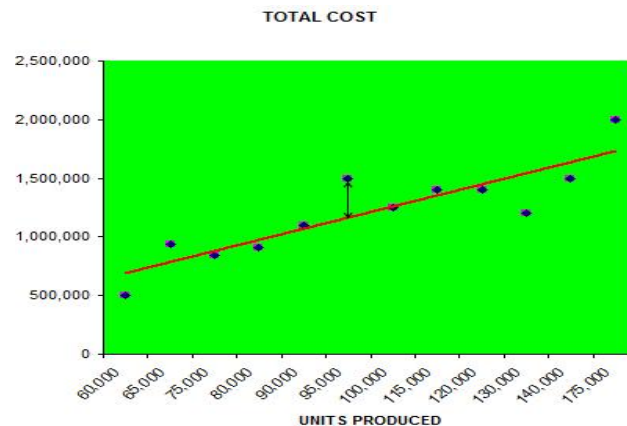
Note: Difference between Step fixed-cost function and Step variable-cost function is that the cost remains the same in step fixed-cost function over *wide* ranges of the activity in each relevant range though in step variable-cost function it remains same over *narrow* ranges of the level of activity in each relevant range.

MIXED COSTS: Many costs contain both variable and fixed components. These costs are called **mixed or semi-variable or semi-fixed costs**. If you have a phone, you probably know more than you wish about such items. Phone agreements usually provide for a monthly fee plus usage charges for excess minutes, internet expense and so forth. With a mixed cost, there is some fixed amount plus a variable component tied to an activity. Mixed costs are harder to evaluate, because they change in response to fluctuations in volume. But, the fixed cost element means the overall change is not directly proportional to the change in activity.

Methods for segregation of Mixed Cost:

1. Graphical Method (Scattered Graph) - The visual fit method or scatter-graph method requires that all recent, normal data observations be plotted on a cost (Y-axis) versus activity (X-axis) graph. A line is then drawn that is a best fit for the data points. When the line is extended to cross the Y-axis (at zero

units of activity), there is a "fairly accurate estimate of fixed costs for the period". The slope can also be calculated to give another reasonably accurate estimate of the variable cost per product. To compute the variable cost per unit, the slope of the line is determined by choosing two points and dividing the change in their cost by the change in the units of activity for the two points selected.



2. High-Low Method (Range Method) - uses the total costs incurred at the high and low levels of activity to classify mixed costs into fixed and variable components. The difference in costs between the high and low levels represents variable costs.

$$\text{Variable Cost per unit} = \frac{\text{Changes in Total Costs}}{\text{High Minus Low Activity Level}}$$

The fixed cost can be found by subtracting the total variable cost at either the high or the low activity level from the total cost at that activity level.

3. Comparison by period (Level of Activity Method) – This method is same as Range Method except high & low activities we arbitrarily choose any two activity levels.
4. Least Squares Method – This method uses mathematical approach to determine the components of variable & fixed expenses. The following regression equation for a straight line can be used to express the relationship between a mixed cost & the level of activity:

$$Y = a + bX$$

We will solve following equations to yield the values of parameters a and b of the above equation.

$$\begin{aligned}\Sigma Y &= Na + b \Sigma X \\ \Sigma XY &= a \Sigma X + b \Sigma X^2\end{aligned}$$

- ☐ Y = the total mixed cost
- ☐ a = the total fixed cost
- ☐ b = the variable cost per unit of activity
- ☐ X = the level of activity
- ☐ N = No. of activities

This equation makes it very easy to calculate what the total mixed cost would be for any level of activity within the relevant range.

5. Analytical Method (Accounting Method): Each account under consideration is classified as either variable or fixed based on the analyst's prior knowledge of how the cost behaves.

Question 1: Briefly explain the methods of separating semi-variable costs into their fixed and variable elements. (6 Marks) May/00

Question 2: Distinguish between 'committed fixed costs' and 'discretionary fixed cost' (5 Marks) May/96

Question 3: From the following information in respect of the semi - variable expenses obtain the fixed and variable elements using the following methods.

- a. Level of activity method.
- b. High low method.

d.	Scatter Graph method	e.	Least squares method
	Month	Machine Hours	Semi-variable maintenance expense (Rs.)
	January	400	2800
	February	300	2600
	March	200	2400
	April	600	3200
	May	500	3000
	June	800	3600

Marginal Costing: The accounting system in which variable cost are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution. (CIMA's Official Terminology). Variable costing & Contribution Approach are other names of marginal costing.

It may be defined as the technique of presenting cost data wherein variable costs and fixed costs are shown separately for managerial decision-making. It should be clearly understood that marginal costing is not a method of costing like process costing or job costing. Rather it is simply a method or technique of the analysis of cost information for the guidance of management which tries to find out an effect on profit due to changes in the volume of output.

Product Cost : A product cost is the sum of the costs assigned to a product for a specific purpose. In Financial accounting courses, it is a concept used in applying the cost plus approach to product pricing in which only the costs of manufacturing the product are included in the cost amount to which the markup is added. The three components of manufacturing costs: direct materials, direct labor, and factory overhead costs. Generally, *inventoriable(manufacturing) costs* are called product costs.

Period Costs: These are all costs in the income statement other than cost of goods sold. Period costs are treated as expense of the A/cing period in which they are incurred because they are expected to benefit revenues in that period and are not expected to benefit revenues in future periods (or because there is not sufficient evidence to conclude that such benefits exists). R&D cost, Design costs, Marketing costs, distribution costs, customer-service costs are some examples of period costs.

Marginal Cost: The cost of one unit of product or service which would be avoided if that unit were not produced or provided. (CIMA's Official Terminology)

Note: In this context, a unit is usually either a single article or a standard measure such as the liter or kilogram, but in certain circumstances is an operation, process or part of an organization.

The marginal cost of a product –“is its variable cost”. This is normally taken to be; direct labour, direct material, direct expenses and the variable part of overheads.

Presentation of Cost Data under Marginal Costing and Absorption Costing

Following presentation of two Performa shows the difference between the presentation of information according to absorption and marginal costing techniques:

Absorption Costing

ABC Ltd. Income Statement For the year ended

(Rs. '000)
yyy

Sales	
Cost of Goods Sold:	
Direct material <i>consumed</i>	xxxx
Direct labour cost	xxxx
Variable manufacturing overhead	xxxx
Fixed manufacturing overhead	xxxx
Manufacturing Cost incurred during the year (a.k.a.Gross Factory Cost)	xxx
Opening Work-in-Progress	xxxx
Less: Closing Work-in-Progress	xxxx
Total cost of goods manufactured	xxxxx

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Costing & O.R.

For notes/updates/amendments on all subjects log on: <http://groups.yahoo.com/group/costingbyparaggupta>

Add: Op. stock of finished goods (valued at total cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at total cost of current year)	xxxx	yyyy
Gross profit/Margin (i.e. Sales-Cost of goods sold)		yyyyy
Less: Operating Costs:		
These are period costs → Selling and distribution costs (Both Fixed & Variable)	xxxx	
Administration costs, etc. (Both Fixed & Variable)	xxxx	yyyy
Operating Income		zzzz

Marginal Costing

ABC Ltd. Income Statement (a.k.a. *Contribution Income Statement*) For the year ended

		(Rs. '000)
Sales		yyy
Total variable cost:	xxxx	
Direct material consumed	xxxx	
Direct labour cost	xxxx	
Variable manufacturing overhead	xxxx	
Variable cost of goods produced	xxxxx	
Add: Op. stock of finished goods (valued at Total Var. Cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at Total Var. Cost of current year)	xxxx	
Variable Cost of Goods Sold	xxxx	
Add: Variable administration, selling and dist. overhead	xxxxx	
Total variable cost		yyyy
Contribution Margin (Sales - Total variable cost)		yyyyy
Less: Fixed operating costs (Production, administration, selling and distribution)		yyyy
Operating Income		zzzz

1. Net Income/Profit = Operating Income – Non Operating Expenses (e.g. Income Taxes, Interest, etc.)
2. As Non Operating Expenses are generally not given in question, we take Operating Income as Net Profit

Question 4: State the distinction between Marginal Costing and Absorption Costing. (7 Marks) Nov/01

Absorption Costing

1. It is a total cost technique i.e. both variable and fixed costs are charged to products, processes or operations.
2. Fixed factory overheads are absorbed by the production units on the basis of a predetermined fixed factory overhead recovery rate based on normal capacity. Under/over absorbed overheads are adjusted before arriving at the figure of profit for a particular period.
3. Inspire of best possible forecast and equitable basis of apportionment/allocation of fixed costs, under or over recovery of fixed overheads generally arises.
4. Managerial decisions under this costing technique are based on profit i.e. excess of sales value over total costs, which may at times lead to erroneous decisions.

Marginal Costing

Here only variable costs are charged to product, processes or operations. Fixed costs are charged as period costs to the profit statement of the same period in which they are incurred.

The cost of production under this method does not include fixed factory overheads and therefore, the value of closing stock comprises of only variable costs. No part of the fixed expenses is included in the value of closing stock and carried over to the next period.

Since fixed overheads are not included in the cost of production, therefore the question of their under/ over recovery does not arise.

Here decisions are made on the basis of contribution i.e. excess of sales price over variable costs. This basis of decision making results in optimum profitability.

Cost-Volume-Profit Analysis

Cost-volume-profit (CVP) analysis is used to determine how changes in costs and volume affect a company's operating income and net income. In performing this analysis, there are several assumptions made, including:

- ☐ Sales price per unit, Variable costs per unit & total fixed costs are known & constant (Within relevant range & time period) & if represented graphically they are linear in behavior (representing straight lines).
- ☐ Other variables like production efficiency, production methods, and price levels remain constant.
- ☐ Everything produced is sold.
- ☐ All the company's costs, including manufacturing, selling, and administrative costs, be identified as variable or fixed
- ☐ Revenue & Costs are only affected because activity changes.
- ☐ If a company sells more than one product, they are sold in the same mix (i.e. **constant sales mix**).
- ☐ All revenues & costs can be added, subtracted & compared without taking into account time value of money.

Contribution margin and contribution margin ratio

Key calculations when using CVP analysis are the **contribution margin** and the **contribution margin ratio**. The contribution margin represents the amount of income or profit the company made before deducting its fixed costs. Said another way, it is the amount of sales available to cover (or contribute to) fixed costs. When calculated as a ratio, it is the percent of sales available to cover fixed costs. Once fixed costs are covered, the next rupee of sales results in the company having income. The contribution margin (a.k.a. contribution) is sales revenue minus all variable costs. To calculate the contribution margin ratio, the contribution margin is divided by the sales or revenues amount. **Contribution Margin Ratio is also popularly known as Profit Volume Ratio (P/V Ratio) & Contribution Sales Ratio (C/S Ratio).**

Single product contribution income statement

Units	XXXX
	(Rs. '000)
Sales	XXX
Less: Variable cost	XXX
Contribution	XXX
Less: Fixed cost	XXX
Profit	XXX

Multi-product contribution income statement

Particulars	A	B	C	Total
Sales	XXX	XXX	XXX	XXX
Less: Variable cost	XXX	XXX	XXX	XXX
Contribution	XXX	XXX	XXX	XXX
Less: Specific Fixed cost	XXX	XXX	XXX	XXX
Total	XXX	XXX	XXX	XXX
Less: General/Common fixed cost				XXX
Profit				XXX

Formulae for Calculation:

- Profit (Operating Income) = Sales – Variable Costs – Fixed Costs
- Contribution = Sales – Variable costs
- Contribution = Fixed Cost + Profit
- Sales – Variable cost = Fixed cost + Profit
- P/V ratio (or C/S ratio) = Contribution ÷ Sales
 - = Contribution per unit ÷ Selling price per unit
 - = Change in Contribution ÷ Change in Sales
 - = Change in Profit ÷ Change in Sales
 - = Profit ÷ Margin of Safety Sales
 - = 1 – Variable Cost Ratio

- Profit = (Sales × P/V ratio) - Fixed Cost = P/V ratio × Margin of Safety sales(Rs.)
= Contribution p.u. × Margin of safety (in units)

Break-even point

The break-even point represents the level of sales where net income equals zero. In other words, the point where sales revenue equals total variable costs plus total fixed costs, and contribution margin equals fixed costs. Variable costs represent all variable costs including costs classified as manufacturing costs, selling expenses, and administrative expenses. Similarly, the fixed costs represent total manufacturing, selling, and administrative fixed costs.

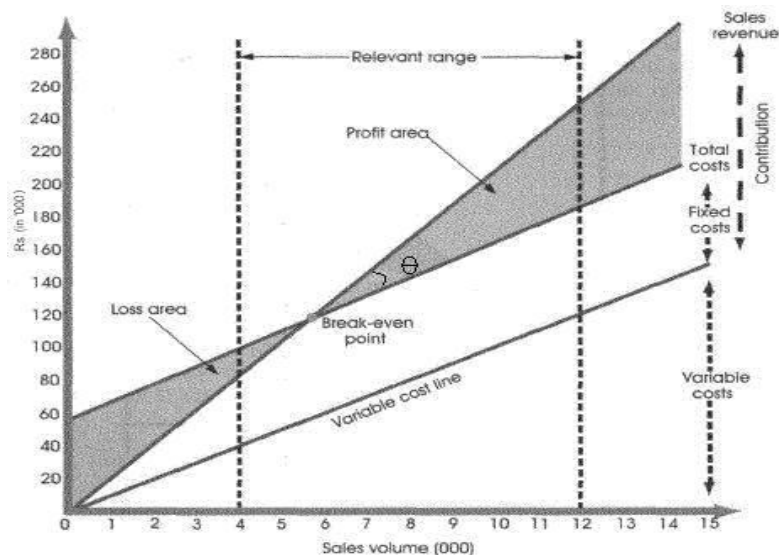
- Break Even point (in units) = Fixed Cost ÷ Contribution *per unit*

Break-even point (in rupees): The break-even point in sales rupees is calculated by dividing total fixed costs by the contribution margin ratio.

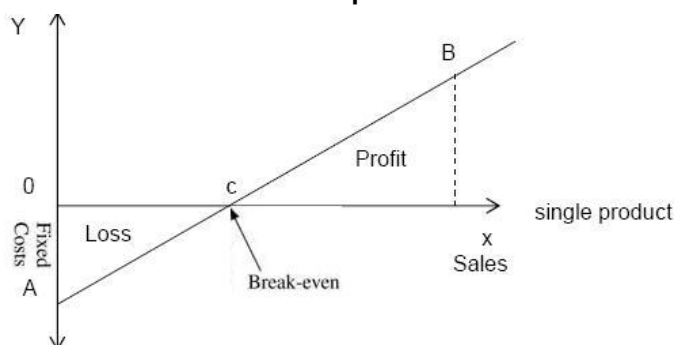
- Break Even Sales (in sales value) = Fixed Cost ÷ P/V ratio
- Break Even Sales (in sales value) = Variable Costs + Fixed Costs

Once the break-even point in units has been calculated, the break-even point in sales rupees may be calculated by multiplying the number of break-even units by the selling price per unit. This also works in reverse. If the break-even point in sales rupees is known, it can be divided by the selling price per unit to determine the break-even point in units.

Contribution Break Even Chart



Profit Graph



Question 9: A company manufactures a single product having a marginal cost of Rs. 0.75 per unit. Fixed Cost is Rs. 15000 per annum. The market is such that up to 40000 units can be sold at a price of Rs. 1.50 per unit, but any additional sale must be made at Re. 1 per unit. Company has a planned profit of Rs. 25000. How many units must be made and sold.

[Ans.: 80000]

Question 10(Sensitivity analysis): The Super co. owns and operates six outlets in and around Kansas City. You are given the following corporate budget data for next year:

	(Rs.)
Revenue	1,00,00,000
Fixed Costs	17,00,000
Variable Costs	82,00,000

Variable costs change with respect to the number of units sold.

Required:

Compute the budget operating income for each of the following deviations from the original budget data. (Consider each case independently.)

- A 10% increase in contribution margin, holding revenues constant.
- A 10% decrease in contribution margin, holding revenues constant.
- A 5% increase in fixed costs.
- A 5% decrease in fixed costs.
- An 8% increase in units sold.
- An 8% decrease in units sold.
- A 10% increase in fixed costs and 10% increase in units sold.
- A 5% increase in fixed costs and 5% decrease in variable costs.

[Ans.: 280000,(80000),15000,185000,244000,(44000),110000,425000]

Question 11 (Sensitivity analysis): If labour costs and material cost are likely to go up by 10% and 5% respectively per unit, what is the percentage increase necessary in selling price to keep the P/V of 20% as before, assuming that the ratio between material and labour is 3:2, and variable overheads is nil.

[Ans.: 7%]

Question 12: H Ltd. produces Pens and Pencils. The company's budget for 2008 includes the following data:

	Pens	Pencils
Unit Selling Price (Rs.)	10	5
Contribution Margin ratio (%)	40	60

The budget is designed to show a figure of profit or loss for each product, after apportioning joint fixed costs of Rs. 100000 in proportion to the number of units of each product sold.

For 2008, Pens are budgeted to show a profit of Rs. 14000, and pencils a loss of Rs. 2000. The number of units of each product sold is expected to be equal.

You are required to write a report to the managing director of H Ltd. advising him on the basis of the information given whether to implement any of the following three proposals:

- to increase the price the pencil by 25%, in the expectation that the price elasticity of demand over this range of prices will be unity;
- to make changes to the production process that would reduce the joint fixed costs by 12.5% and increase the variable costs of each product by 10%;
- to introduce both the above changes.

[Ans.: (i) Increase in contribution = Rs. 6400; (ii) Decline in profit = Rs. 300; (iii) Increase in profit = Rs. 6740]

Targeted income

CVP analysis is also used when a company is trying to determine what level of sales is necessary to reach a specific level of income, also called **targeted income**. To calculate the required sales level, the targeted income is added to fixed costs, and the total is divided by the P/V Ratio to determine required sales rupees, or the total is divided by contribution per unit to determine the required sales level in units.

$$\text{Required Sales Revenue in Rupees} = \frac{\text{Fixed Costs} + \text{Target Operating Income}}{\text{P/V Ratio}}$$

$$\text{Required Sales in Units} = \frac{\text{Fixed Costs} + \text{Target Operating Income}}{\text{Contribution Margin per unit}}$$

This calculation of targeted income assumes it is being calculated for a division as it ignores income taxes. If a targeted net income (income after taxes) is being calculated, then income taxes would also be added to fixed costs along with targeted net income.

$$\text{Required Sales Revenue in Rupees} = \frac{\text{Fixed Costs} + \text{Target Net Income} + \text{Income Tax}}{\text{P/V Ratio}}$$

$$\text{Required Sales in Units} = \frac{\text{Fixed Costs} + \text{Target Net Income} + \text{Income Tax}}{\text{Contribution Margin per unit}}$$

Where, **Target Operating Income = Target Net Income + Income Taxes**

If Rate of Income Tax is known & Value of Income Tax not known then,

$$\text{Target Operating Income} = \frac{\text{Target Net Income}}{1 - \text{Tax Rate}}$$

Question 13: X Ltd. is a recently formed company, manufacturing vehicles. Its cost structure is such that on sale of every Rs.2,000, it spends Rs.1400/-. In 2002, when the total sales revenue was Rs.10,00,000/-, it sustained loss of Rs. 2,00,000/- You are required to compute the break even point. If the minimum net profit to be earned is Rs.2,00,000/- in order to justify the survival, what must be sales revenue?

[Ans.:1666667 & 2333333]

Question 14(Volume analysis): The following figures for profit & sales are obtained from the accounts of X Co. Ltd.

Year	Sales	Profit
	Rs.	Rs.
2002	20,000	2,000
2003	30,000	4,000

- Find out Contribution Sales Ratio.
- What is Break Even Sales
- Find out the sales to earn a profit of Rs.6000 in 2004.
- What is the profit when sales are Rs.12000 in 2004?

[Ans.:0.2,10000,40000,(400)]

Margin of Safety:

Margin of safety is the difference between the sales or productions at a particular level of activity and the break even sales a production. A large margin of safety indicates the soundness of the business and correspondingly a small margin of business indicates a not too-sound position.

Margin of safety can be improved by lowering the fixed cost and variable costs, increasing the volumes of sales and production, increasing the selling prices or changing the product mix resulting into a better overall Profit/Volume ratio.

- Margin of safety Sales = Sales at selected activity – BEP Sales
- Margin of safety Sales = Profit at selected activity ÷ P/V ratio
- Margin of safety (%) = Margin of Safety Sales X 100 ÷ Sales at selected activity
- Margin of safety (%) = 1 – BEP (%)

Question 15(Single product marginal cost sheet): A company producing a single article sells it at Rs.10 each. The marginal cost of production is Rs.6 each and fixed cost is Rs.400 per annum.

Calculate

- The P/V ratio;
- The break-even sales;
- The sales to earn a profit Rs.500;
- Profit at sales Rs.3, 000;
- New break-even point if sales price is reduced by 10%.
- MOS when the profit earned in Rs.200 and PVR – 40%.

[Ans.: 0.4, 1000, 2250, 800, 1200, 500]

Question 16: From the following particulars, you are required to calculate:

- P/V Ratio
- BEP for sales;
- Margin of Safety;
- Profit when sales are Rs.2,00,000/-
- Sales required to earn a profit of Rs.40,000/-

Year	Sales	Profit
------	-------	--------

I	Rs. 2,40,000	18,000
II	Rs. 2,80,000	26,000

You may make plausible assumptions. Also evaluate the effect on II year's profit of

(a) 20% decrease in sales quantity.

(b) 20% decrease in sales quantity accompanied by 10% increase in sales price and reduction of Rs. 3,500/- in fixed costs.

[Ans.: 0.20, 150000, 130000, 10000, 350000, (a) Increase in profit 14700; (b) Increase in profit 14700]

Question 17: A single product company furnishes the following data:

	Year 2007	Year 2008
Sales	24,00,000	?
P/V Ratio	33-1/3 %	30%
Margin of Safety	25%	40%

While there was no change in volume of sales in year 2008, the selling price was reduced. Calculate sales, fixed cost and profit for year 2008.

[Ans.: Sales: 2285714, Fixed Cost: 411429, Profit: 274285]

Angle of Incidence:

It is the angle of intersection (θ) between the sales & the total cost lines. It indicates the profit earning capacity of the concern at a certain level of sales production. The larger the angle of incidence the more is the profit earning capacity & vice versa. It also provides an indication as to what extent the output & sales price may be varied to attain a desire level of profit. It gives an easy & clear idea to the profitability under different levels of activities & also for different product mix & is a simple visual aid to find out profit earning capacity without going in for any calculation.

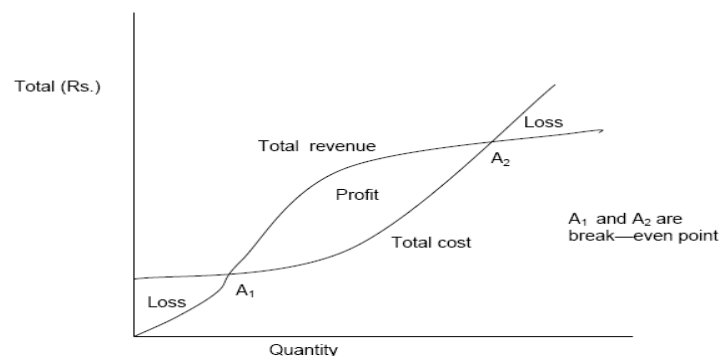
Curvilinear CVP analysis

In CVP analysis, the usual assumption is that the total sales line and variable cost line will have linear relationship, i.e. these lines will be straight lines, and however, in actual practice it is unlikely to have a linear relationship for two reasons, namely:

--- After the saturation point of existing demand the sales value may show a downward trend.

--- The average unit variable cost declines initially, reflecting the fact that, as output increases the firm will be able to obtain bulk discounts on the purchase of raw materials and can also benefit from division of labour. When the plant is operated at further higher levels of output, due to bottlenecks and breakdowns the variable costs per unit will tend to increase. Thus the law of increasing costs may operate and the variable cost per unit may increase after reaching a particular level of output.

In such cases, the contribution will not increase in linear proportion on the phenomenon of diminishing marginal productivity; the total cost line will not be straight, as assumed but will be of curvilinear shape. This situation will give rise to two break even points. The optimum profit is earned at the point where the distance between sales and total cost is the greatest.



Since Marginal Costing has been shifted from Final to (I)PCC, this book only basic concepts of CVP & doesn't contains certain important topics like Marginal vs Absorption, Composite BEP, BEP with semi-variable cost, BEP with limiting factor, Cash BEP, Multiple BEP, etc. Students are expected to have a comprehensive knowledge of concepts of these topics before they initiate themselves towards advance studies for the final examination.

Activity Based Costing

Cost Object: It is an item for which cost measurement is required e.g. a product, a job or a customer.

Activities: Activities comprise of units of work or tasks. For example, purchase of materials is an activity consisting a series of tasks like purchase requisition, advertisement inviting quotations, identification of suppliers, placement of purchase order, follow-up etc.

Types of Activities: Activities basically fall into four different categories, known as the manufacturing cost hierarchy. These categories were first identified by Cooper in 1990 and help to determine the type of activity cost driver required. The categories are:

(i) Unit level activities (a.k.a. Volume related activities): These are activities for which the consumption of resources can be identified with the number of units produced. E.g. Use of indirect materials, Inspection or testing of every item produced or say every 100th item produced, Indirect consumables, etc.

(ii) Batch level activities: The costs of some activities (mainly manufacturing support activities) are driven by the number of batches of units produced. These are activities related to setting up of a batch or a production run. The costs of such activities vary with the number of batches made, but is fixed for all units within that batch. E.g. Production scheduling, Material movement, Machine set up costs, Inspection of products – like first item of every batch, etc.

(iii) Product-sustaining activities or service sustaining activities: The costs of some activities (often once only activities) are driven by the creation of a new product line and its maintenance. These are activities performed to support different products in the product line. E.g. Designing the product, Producing parts to a certain specification, Advertising costs, if advertisement is for individual products, etc.

(iv) Facility-sustaining or business-sustaining activities: These are activities necessary for sustaining the manufacturing process and cannot be directly attributed to individual products. E.g. Maintenance of buildings, Plant security, Production manager's salaries, Advertising campaigns promoting the co., etc.

Value Added and Non-value Added activities

Value Added Activities(VA)	Non Value Added Activities (NVA)
These are activities necessary for the performance of the process.	These are additional and extraneous activities, not fully necessary for the performance of the process.
These represent work that is valued by the external or internal customer.	These represent work that is not valued by the external or internal customer.
They improve the quality or function of a product. Hence, the customers are usually willing to pay for the service. VA activities result in "Cost" and not in losses.	NVA activities do not improve the quality or function of a product or service but they can adversely affect costs and prices. NVA activities create waste, result in delay of some sort, add cost to the products or services for which the customer is not willing to pay.
Example: Making product more versatile for certain other uses.	Examples: Moving materials and machine set up for a production run.

Cost Driver: It is the factor that causes a change in the cost of an activity. Instead of using the term 'allocation bases' or 'overhead allocation rates' the term cost driver is used in ABC system. Cost Drivers are classified into:

- **Resource Cost Driver:** It is a measure of the quantity of resource consumed by activity. It is used to assign the cost of a resource to an activity or cost pool.
- **Activity Cost Driver:** It is a measure of the frequency and intensity of demand, placed on activities by cost objects. It is used to assign activity costs to cost objects. Activity cost drivers can be transaction drivers (e.g. No. of purchase orders processed, no. of customer orders processed, etc.) as well as

duration drivers (it represent amount of time required to perform an activity e.g. Setup hours, inspection hours, etc.).

Common activities and associated cost drivers:

Major Activities	Associated Costs	Cost Driver
Processing purchase orders for materials and parts	Labour cost for workers determining order quantities, contracting vendors, and preparing purchase orders	Number of purchase orders processed
Handling material and parts	Labour cost for workers handling material and parts, depreciations of equipment used to move material and parts (e.g. depreciation of fork lift trucks), etc.	Number of material requisitions
Inspecting incoming material and parts	Labour cost for workers performing inspections, depreciation of equipment used to test strength of materials, tolerances, etc.	Number of receipts
Inspecting finished goods	Labour cost for finished goods inspectors, depreciation of equipment used to test whether finished goods meet customer specifications, etc.	Number of assembly labour hours
Setting up equipment	Labour cost for workers involved in setups, depreciation of equipment used to adjust equipment	Number of setups
Producing goods using manufacturing equipment	Depreciation of manufacturing equipment	Number of machine hours
Supervising assembly workers	Salary of assembly supervisors	Number of assembly labour hours
Packing customer orders	Labour cost for packing workers, cost of packing materials, etc.	Number of boxes shipped

Traditional Cost Accounting

It arbitrarily allocates overheads to the cost objects. Total Company's overhead is allocated based on volume based measure e.g. labour hours, machine hours. Here the main assumption is that there is a relationship between overhead & volume based measure.

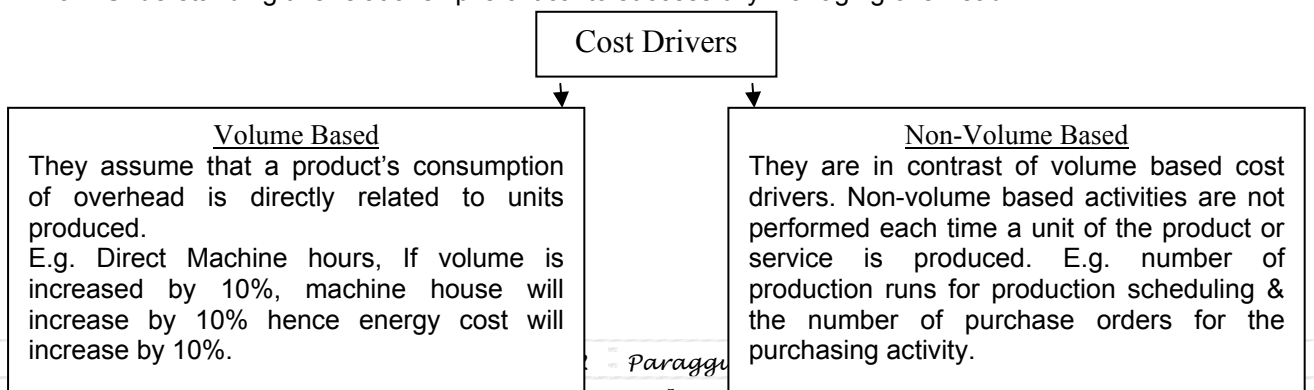
Activity Based Costing

ABC is not a method of costing, but a technique for managing the organization better. It is a one-off exercise which measures the cost and performance of activities, resources and the objects which consume them in order to generate more accurate and meaningful information for decision-making. ABM draws on ABC to provide management reporting and decision making.

It is more accurate cost management methodology. It focuses on indirect costs (overhead). It traces rather than allocates each expense category to the particular cost object. It converts "indirect" expenses to "direct".

ABC Basic Premise

- Cost objects consume activities.
- Activities consume resources.
- This consumption of resources is what derives costs.
- Understanding this relationship is critical to successfully managing overhead.



Remember, Using only volume-based cost drivers to assign non-volume related overhead costs can result in the reporting of distorted product costs.

Product Diversity - Difference in product size, product complexity, size of batches and set-up times cause product diversity.

Product cost distortion occurs when both of these conditions occur:

- a) Non-Volume based overhead costs are a large proportion of total overhead costs.
- b) Product diversity applies.

When & Why to use ABC

- Overhead is high-New production techniques have resulted in the increase of the proportion of support service costs in the total cost of delivering value to customers. ABC improves the accuracy of accounting for support service costs.
- Products are diverse-There is product and customer proliferation. Demand on resources by products / customers differ among product / customers. Therefore, product / customer profitability can be measured reasonably accurately, only if consumption of resources can be traced to each individual product / customer
- Costs of errors are high-The costs associated with bad decisions have increased substantially.
- Competition is stiff- Fierce competitive pressure has resulted in shrinking profit margin. ABC helps to estimate cost of individual product or service more accurately. This helps to formulate appropriate marketing / corporate strategy.

Steps involved in Activity Based Costing:

Step 1: Identify the various Activities within the organization.

Only significant activities shall be considered for decision-making purposes.

Step 2: Relate the Overheads to the Activities using Resources Cost Drivers

- Overheads will be related to Support and Primary Activities
- Resources Cost Drivers, i.e. the quantity of resources used by an activity is used for this purpose.
- All costs will be identified under the activities, thus creating Activity Cost Pools/Cost Buckets.

Step 3: Determine the Activity Cost Drivers for each Activity Cost Pool

- Activity cost drivers used to relate the overheads collected in the cost pools to cost objects (products) should be determined.
- This is based on the factor that drives the consumption of the activity, i.e. the answer to the question: what causes the activity to incur costs? For example in production scheduling, the driver will be number of batches ordered.

Step 4: Calculate Activity Cost Driver Rate (i.e. $\frac{\text{Activity Cost Pool}}{\text{Activity Cost Driver}}$) & relate costs to products.

- Activity Cost Driver Rates are computed for each activity, just like overhead absorption rates.
- The rates will be multiplied by the different amounts of each activity that each product/other cost object consumes, so as to ascertain its cost.

A comparison of traditional & ABC systems

Traditional Absorption Costing	Activity Based Costing
Overheads are first related to departments cost centres (Production and Service Cost Centres)	Overheads are first related to activities or grouped into Cost Pools (<i>rather than departments</i>).
Only two types of activities viz. Unit Level Activities and Facility Level Activities are identified.	All levels of activities in the manufacturing cost hierarchy viz. Unit Level, Batch Level, Product Level and Facility Level are identified.

Direct labour & machine hours are the allocation bases that are normally used.	Many different types of second stage cost drivers are used, including non-volume-based drivers.
This method relates overheads to cost centres i.e. locations. It is not realistic of the behaviour of costs.	This method relates overheads to the causal factor i.e. driver. Thus, it is more realistic of cost behaviour.
Overhead Rates can be used to ascertain cost of products only.	Activity Cost Driver Rates can be used to ascertain cost of products and also cost of other cost objects such as customer segments, distribution channels. etc.

Activity Based Management

ABM supports business excellence by providing information to facilitate long-term strategic decisions about such things as product mix and sourcing. It allows product designers to understand the impact of different designs on cost and flexibility and then to modify their designs accordingly. ABM also supports the quest for continuous improvement by allowing management to gain new insights into activity performance by focusing attention on the sources of demand for activities and by permitting management to create behavioral incentives to improve one or more aspects of the business.

Difference between ABC and ABM:

Activity Based Costing	Activity Based Cost Management
ABC refers to the technique of determining the costs of activities and the cost of output that those activities produce.	It refers to the management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage.
The aim of ABC is to generate improved cost data for use in managing a company's activities.	The ABM is a much broader concept. Its aim is to use information generated by ABC, for effective business processes and profitability.

Question 1: Explain the concept of cost drivers indicate what you will consider as cost drivers for the following business function:

Research & development; and Customer service.

(4 Marks) Nov./98

Question 2: What is activity based costing?

(4 Marks) May/00

Question 3: Explain the concept of activity based costing. How ABC system supports corporate strategy?

(4 Marks) Nov./05

Question 4: Differentiate between 'Value-added' and 'Non-value-added' activities in the context of Activity-based costing. Give examples of Value-added and Non-value-added activities. (4 Marks) May/06

Question 5: What are the areas in which activity based information is used for decision making?

(4 Marks) Nov./00

Question 6: What is the fundamental difference between Activity Based Costing System (ABC) and Traditional Costing System? Why more and more organizations in both the manufacturing and non-manufacturing industries are adopting ABC?

(10 Marks) Nov/07

Question 7: Give two examples for each of the following categories in activity based costing:

- (i) Unit Level activities
- (ii) Batch Level activities
- (iii) Product Level activities
- (iv) Facility Level activities

(3 Marks) Nov./02[Adapted] & (4 Marks) Nov/06

Question 8: "Cost can be managed only at the point of commitment and not at the point of incidence. Therefore it is necessary to manage cost drivers to manage cost." Explain the statement with reference to structural and executional cost drivers.

(5 Marks) Nov/07

Question 9: Why are conventional product costing systems more likely to distort product costs in highly automated plants? How do activity based costing deal with such a situation?

(4 Marks) May/06

Question 10: Traditional Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows:

Particulars	Product A	Product B	Product C
-------------	-----------	-----------	-----------

Direct materials	50	40	40 Rs. /u
Direct labour @ Rs. 10 Rs./hour	30	40	50 Rs. /u
Production overheads	30	40	50 Rs. /u
Total Cost	110	120	140 Rs. /u
Quantity produced	10,000	20,000	30,000 Units

Traditional Ltd. was absorbing overheads on the basis of direct labour hours. A newly appointed management accountant has suggested that the company should introduce ABC system and has identified cost drivers and cost pools as follows:

Activity Cost Pool	Cost Driver	Associated Cost
Stores Receiving	Purchase Requisitions	2,96,000
Inspection	Number of Production runs	8,94,000
Despatch	Orders Executed	2,10,000
Machine Setup	Number of setups	12,00,000

The following information is also supplied:

Details	Product A	Product B	Product C
No. of Setups	360	390	450
No. of Orders Executed	180	270	300
No. of Production runs	750	1,050	1,200
No. of Purchase Requisitions	300	450	500

You are required to calculate activity based production cost of all the three products.

[Ans.: A - Rs. 1504940; B – Rs. 2485060; C – Rs. 3710000]

(5 Marks)-June/09-New Course

Question 11: Relevant data relating to a company are:

Products

Particulars	P	Q	R	Total
Production and sales (units)	60,000	40,000	16,000	
Raw material usage in units	10	10	22	
Raw material costs	Rs.50	40	22	49,52,000
Directs labour hours	2.5	4	2	3,42,000
Machine hours	2.5	2	4	2,94,000
Direct labour costs	Rs.16	24	12	
No. of production runs	6	14	40	60
No. of Deliveries	18	6	40	64
No. of receipts	60	140	880	1080
No. of production orders	30	20	50	100

Overheads:

	(Rs.)
Set up	60,000
Machines	15,20,000
Receiving	8,70,000
Packing	5,00,000
Engineering	7,46,000

The company operates a JIT inventory policy and receives each component once per production run.

Required:

- Compute the product cost based on direct labour-hour recovery rate of overheads.
- Compute the product costs using activity based costing.

[Ans.: Direct labour-hour recovery rate: 93.03, 107.24, 55.62; ABC: 85.91, 82.41, 144.32]

Question 12: A company manufactures three types of products namely P, Q & R. The data relating to a period are as under:

	P	Q	R
Machine hour per unit	10	18	14
Direct labour hour per unit @ Rs. 20	4	12	8
Direct material per unit Rs.	90	80	120
Production (units)	3000	5000	20000

Currently the company uses traditional costing method and absorbs all production overheads on the basis of machine hours. The machine hour rate of overhead is Rs. 6 per hour.

The company proposes to use activity based costing system and the activity analysis is as under:

	P	Q	R
Batch size (units)	150	500	1000
Number of purchase orders per batch	3	10	8
Number of inspections per batch	5	4	3

The total production overheads are analyzed as under:

Machine set up costs	20%
Machine operation costs	30%
Inspection costs	40%
Material procurement related costs	10%

Required:

- Calculate the cost per unit of each product using traditional method of absorbing all production overheads on the basis of machine hours.
- Calculate the cost per unit of product using activity based costing principles.

[Ans.: (i) 230, 428, 364 (ii) 427, 425, 335.20]

(7 Marks) Nov./08-Old Course

Question 13: The following are Product Nova Shaft's data for next year budget:

Activity	Cost Driver	Cost Driver volume/year	Cost pool
Purchasing	Purchase orders	1500	Rs. 75000
Setting	Batches produced	2800	Rs. 112000
Materials handling	Materials movements	8000	Rs. 96000
Inspection	Batches produced	2800	Rs. 70000
Machining costs	Machine hours	50000	Rs. 150000
Purchase orders	25		
Output	15000 units		
Production batch size	100 units		
Materials movement per batch	6		
Machine hours per unit	0.1		

Required:

- Calculate the budgeted overhead costs using activity based costing principles.
- Calculate the budgeted overhead Costs using absorption costing (absorb overhead using machine hours).
- How can the company reduce the ABC for Product Nova Shaft?

(9 Marks) June/09-Old Course

[Ans.: (i) Rs. 26300; (ii) Rs. 15090]

Question 14: XYZ Ltd. manufactures four products, namely A, B, C and D using the same plant and process.

The following information relates to a production period:

Product	A	B	C	D
Output in units	720	600	480	504
Cost per unit:	Rs.	Rs.	Rs.	Rs.
Direct Material	42	45	40	48
Direct labour	10	9	7	8
Machine hours per unit	4 hrs.	3 hrs.	2 hrs.	1 hr

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. Using machine hour rate currently absorbs the production overheads. The total overheads incurred by the company for the period is as follows:

	Rs.
Machine operation and Maintenance cost	63,000
Setup costs	20,000
Store receiving	15,000
Inspection	10,000
Material handling and dispatch	2,592

During the period the following cost drivers are to be used for the overhead cost:

Cost	Cost driver
Setup cost	No. of production runs
Store receiving	Requisition raised
Inspection	No. of production runs
Material handling and dispatch	Orders executed

It is also determined that:

· Machine operation and maintenance cost should be apportioned between setup cost, store receiving and inspection activity in 4:3:2.

· Number of requisition raised on store is 50 for each product and the no. of order executed is 192, each order being for a batch of 12 of a product.

Required:

- Calculate the total cost of each product, if all overhead costs are absorbed on machine hour rate basis.
- Calculate the total cost of each product using activity base costing.
- Comment briefly on differences disclosed between overheads traced by present system and those traced by activity base costing.

(11 Marks) Nov/04

[Ans.: (a) A – Rs. 89280, B – Rs. 64800, C – Rs. 39840, D – Rs. 37296, (b) A – Rs. 69825, B – 47100, D – Rs. 53541]

Question 15: Biscuit Ltd. Manufactures 3 types of biscuits, A, B and C, in a fully mechanised factory. The company has been following conventional method of costing and wishes to shift to Activity Based Costing System and therefore wishes to have the following data presented under both the systems for the month.

Inspection cost	Rs. p.m.	73,000	
Machine – Repairs & Maintenance	Rs. p.m.	1,42,000	
Dye cost	Rs. p.m.	10,250	
Selling overheads	Rs. p.m.	1,62,000	
	Product A	B	C
Prime cost (Rs. per unit)	12	9	8
Selling price (Rs. Per unit)	18	14	12
Gross production (units/production run)	2,520	2,810	3,010
No. of defective units / production run	20	10	10
Inspection:			C
No. of hours / production run	3	4	4
Dye cost / production run (Rs.)	200	300	250
No. of machine hours / production run	20	12	30
Sales – No. of units / month	25,000	56,000	27,000

The following additional information is given:

- No accumulation of inventory is considered. All good units produced are sold.
- All manufacturing and selling overheads are conventionally allocated on the basis of units sold.
- Product A needs no advertisement. Due to its nutritive value, it is readily consumed by diabetic patients of a hospital. Advertisement costs included in the total selling overhead is Rs. 83,000.
- Product B needs to be specially packed before being sold, so that it meets competition. Rs. 54,000 was the amount spent for the month in specially packing B, and this has been included in the total selling overhead cost given.

You are required to present product-wise profitability of statements under the conventional system and the ABC system and accordingly rank the products.

(11 Marks) May/08

[Ans.: Conventional : Net profit(Rank) is A-57959(II), B- 77403(I) & C- 10467(III), ABC : Net profit(Rank) is A- 84813 (I), B-61237 (II) & C- (220)(III)]

Question 16: Bombay steel Ltd. manufacture four products, namely A,B,C and D, using the same plant and process. The following information relates to a production period:

Product	Volume	Material cost per unit (Rs.)	Direct labour per unit	Machine time per unit	Labour cost per unit
A	500	5	½hours	¼hours	3
B	5,000	5	½hours	¼hours	3
C	600	16	2 hours	1hours	12
D	7,000	17	1-1/2hours	1-1/2hours	9

Total production overhead recovered by the cost accounting system is analysed under the following heading:

Factory overhead applicable to machine-oriented activity	37,424
Set-up costs are	4,355
Cost of ordering materials	1,920
Handling materials	7,580
Administration for spare parts	8,600

These overhead costs are absorbed products on a machine hour rate of Rs. 4.80 per hour giving an overhead cost per product of:

A=Rs. 1.20 B=Rs. 1.20 C=Rs. 4.80 D=Rs. 7.20

However, investigation into the production overhead activities for the period reveals the following totals:

Product Number of set- Number of Number of times Number of spare

	ups	material orders	material was handled	parts
A	1	1	2	2
B	6	4	10	5
C	2	1	3	1
D	8	4	12	4

You are required:

- to compute an overhead cost per product using activity based costing, tracing overheads to production units by means of cost drive.
- to compute briefly on the difference disclosed between overheads traced by the present system and those traced by activity based costing.

[Ans.: Value of overhead in Traditional: 1.2, 1.2, 4.8, 7.2; Value of overhead in ABC: 5.63, 2.49, 6.76, 5.79]

Question 17: Having attached a CIMA course on activity based costing (ABC) you decide to experiment by applying the principles of ABC to the four products currently made and sold by your company. Details of the four products and relevant information are giving below for one period:

Product	A	B	C	D
Output in units	120	100	80	120
Cost per unit:	Rs.	Rs.	Rs.	Rs.
Directs material	40	50	30	60
Direct labour	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of 10 units. The production overhead is currently absorbed by using a machine hour rate, and the production overhead for the period has been analysed as follows:

	(Rs.)
Machine department costs(rent, business, rates, depreciation and supervision)	10,430
Set-up costs	5,250
Stores receiving	3,600
Inspection / Quality control	2,100
Materials handling and dispatch	4,620

You have ascertained that the "cost drivers" to be used are as listed below for overhead drivers" to costs Shown:

Cost	Cost Driver
Set-up costs	Number of production runs
Store receiving	Requisitions raised
Inspection / quality control	Number of production runs
Materials handling and dispatch	Orders executed

The number of requisitions raised on the stores was 20 for each product and the number of orders executed was 42, each order being for a batch of 10 of a product.

You are required:

- to calculate the total cost for product if all overhead costs are a machine hour basis;
- to calculate the total costs for product, using activity based costing ;
- to calculate and list the unit product costs from your figures in (a) and (b) above, to show the differences and to comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

[Ans.: Machine hour basis: 148, 131, 84, 141; ABC:136.09, 132.57, 99.80,141.07]

Question 18: During the last 20 years, KL Ltd's manufacturing operation has become increasingly automated with Computer-controlled robots replacing operators. KL currently manufactures over 100 products of varying levels of design complexity. A single, plant-wide overhead absorption rate, based on direct labour hours, is used to absorb overhead costs.

In the quarter ended March, KL's manufacturing overhead costs were:

	(Rs. '000)
Equipment operation expenses	125
Equipment maintenance expense	25
Wages paid to technicians	85
Wages paid to Store men	35
Wages paid to despatch staff	40
	310

During the quarter, the company reviewed the Cost Accounting System and concluded that absorbing overhead costs to individual products on a labour hour absorption basis is meaningless. Overhead costs should be attributed to products using an Activity Based Costing (ABC) system and the following was identified as the most significant activities:

- (i) Receiving component consignments from suppliers
- (ii) Setting up equipment for production runs
- (iii) Quality inspections
- (iv) Dispatching goods as per customer's orders.

It was further observed that, in the short-term, KL's overheads are 40% fixed and 60% variable. Approximately, half the variable overheads vary in relation to direct labour hours worked and half vary in relation to the number of quality inspections.^{Note}

Equipment operation and maintenance expenses are apportioned as:

Component stores 15% , manufacturing 70% and goods dispatch 15%

Technician's wages are apportioned as :

Equipment maintenance 30% , set up equipment for production runs 40% and quality inspections 30%.

During the quarter :

- (i) a total of 2000 direct labour hours were worked (paid at Rs. 12 per hr.)
- (ii) 980 components consignments were received from suppliers
- (iii) 1020 production runs were set up
- (iv) 640 quality inspections were carried out
- (v) 420 orders were dispatched to customers.

KL's production during the quarter included components R, S and T. The following information is available:

	Component R	Component S	Component T
Direct labour Hrs worked	25	480	50
Direct Material	Rs. 1,200	Rs. 2,900	Rs. 1,800
Component Consignments Recd.	42	24	28
Production runs	16	18	12
Quality Inspections	10	8	18
Orders (goods) dispatched	22	85	46
Quantity produced	560	12,800	2,400

Required:

(1) Calculate the unit cost of R, S and T components, using KL's existing cost accounting system.

(2) Explain how an ABC system would be developed using the information given. Calculate the unit cost of components R, S and T using ABC system. (11 Marks) May/05 & CIMA Stage 3 [Adapted]

[Ans.: (1) Cost per unit (Under existing cost system)

R	S	T
9.60	6.49	4.23

(2) Cost per unit (Under ABC cost system)

R	S	T
18.682	2.08	5.82]

[Note.: Since this question is only a part question of question asked in CIMA, this paragraph is of no use.]

Question 19: Amar and Naveen architects, have been using a simplified costing system in which all professional labour costs are included in a single direct cost category professional labour and all overhead costs are included in a single indirect cost category, professional support, and allocated to jobs by using professional labour hours as the allocation base. Consider two clients: Host Restaurant, which required 25 hours of design work for a new addition, and Pizza Hut, which required plans for a new floor that took 40 hours to draw. The firm has two partners, who each earn a salary of Rs.1,50,000 a year, and four associates, who each earn Rs. 60,000 per year. Each professional has 1,500 billable hours per year. The professional support is Rs. 10,80,000, which consists of Rs.7,00,000 of design support and Rs.3,80,000 of staff support. Host Restaurant job required five hours of partner time and 20 hours of associate time. Pizza Hut job required 30 hours of partner time and 10 hours of associate time.

Required:

- (i) Prepare job cost sheets for Host Restaurant and Pizza Hut using a simplified costing system with one direct and one indirect cost pool.
- (ii) Prepare job cost sheets for the two clients, using an activity based costing system with two direct cost categories – partner labour and associate labour – and two indirect cost categories – design support and staff

support. Use professional labour in Rupees as the cost allocation base for design support and professional labour hours for staff support.

(iii) Determine the amount by which each job was under – or overcosted, using the simplified costing system.

[Ans.: (i) Host Restaurant – Rs. 4500 & Pizza Hut – Rs. 7200; (ii) Host Restaurant – Rs. 4046 & Pizza Hut – Rs. 9509; (iii) The simplified costing system overcosted Host Restaurant job by Rs.454 and undercosted Pizza Hut job by Rs.2,309.] RTP-May/05

Question 20: A company manufactures several products of varying levels of designs and models. It uses a single overhead recovery rate based on direct labour hours. The overheads incurred by the company in the half of the year are as under:

	Rs.
Machine operation expenses	10,12,500
Machine maintenance expenses	1,87,500
Salaries of technical staff	6,37,500
Wages and salaries of stores staff	2,62,500

During this period, the company introduced activity based costing system and the following significant activities were identified:

- receiving materials and components
- set up of machines for production runs
- quality inspection.

It is determined that:

- The machine operation and machine maintenance expenses should be apportioned between stores and production activity in 20:80 ratio.
- The technical staff salaries should be apportioned between machine maintenance, set up and quality inspection in 30:40:30 ratio.

The consumption of activities during the period under review are as under:

Direct labour hours worked	40,000
Direct wage rate Rs. 6 per hour	
Production set-ups	2,040
Material and component consignments received from suppliers	1,960
Number of quality inspections carried out	1,280

The data relating to two products manufactured by the company during the period are as under:

	Products	
	P	Q
Direct materials costs	Rs. 6,000	4,000
Direct labour hours	960	100
Direct material consignments received	48	52
Production runs	36	24
Number of quality inspections done	30	10
Quantity produced (units)	15,000	5,000

A potential customer has approached the company for the supply of 24,000 units of a component K to be delivered in lots of 3,000 units per quarter. The job will involve an initial design cost of Rs. 60,000 and the manufacture will involve the following per quarter:

Direct materials costs	Rs. 12,000
Direct labour hours	300
Production runs	6
Inspections	24
Number of consignments of direct materials to be received	20

The company desires a mark up of 25% on cost.

Required:

- (i) Calculate the cost of product P and Q based on the existing system of single overhead recovery rate.
- (ii) Determine the cost of product P and Q using activity based costing system.
- (iii) Compute the sales value per quarter of component K using activity based costing system.

[Ans.:	Product P	Product Q
(i) Cost per unit (Rs.)	4.144	1.97
(ii) Cost per unit (Rs.)	3.58	7.31

(iii) Selling price per unit of K is Rs. 14.34]

(12 Marks) May/03 & May/07-RTP

Question 21: ABC electronics makes audio player model 'AB 100'. It has 80 components. ABC sells 10,000 units each month at Rs.3,000 per unit. The cost of manufacturing is Rs.2,000 per unit or Rs.200 lakhs per month for the production of 10,000 units. Monthly manufacturing costs incurred are as follows:

	(Rs. Lakhs)
Direct material costs	100.00
Direct manufacturing labour costs	20.00
Machining costs	20.00
Testing costs	25.00
Rework costs	15.00
Ordering costs	0.20
Engineering costs	19.80
	200.00

Labour is paid on piece rate basis. Therefore, ABC considers direct manufacturing labour cost as variable cost.

The following additional information is available for 'AB 100'

- (i) Testing and inspection time per unit is 2 hours.
- (ii) 10 per cent of 'AB 100' manufactured are reworked.
- (iii) It currently takes 1 hour to manufacture each unit of 'AB 100'
- (iv) ABC places two orders per month for each component. A different supplier supplies each component.

ABC has identified activity cost pools and cost drivers for each activity. The cost per unit of the cost driver for each activity cost pool is follows:

Manufacturing Activity	Description of activity	Cost driver	Cost per unit of cost driver
1. Machine costs	Machining components	Machine hours of capacity	Rs.200
2. Testing costs	Testing components and finished products. (Each unit of 'AB 100' is tested individually)	Testing hours	Rs.125
3. Rework costs	Correcting and fixing errors and defects	Units of 'AB 100' reworked	Rs.1,500 per unit
4. Ordering costs	Ordering of components	Number of orders	Rs.125 per order
5. Engineering costs	Designing and managing of products and processes	Engineering hours	Rs.1,980 per engineering hour

Over a long-run horizon, each of the overhead costs described above vary with chosen cost drivers. In response to competitive pressure ABC must reduce the price of its product to Rs.600 and to reduce the cost by at least Rs.400 per unit. ABC does not anticipate increase in sales due to price reduction. However, if it does not reduce price it will not be able to maintain the current sales level.

Cost reduction on the existing model is almost impossible. Therefore, ABC has decided to replace 'AB 100' by a new model 'AB 200', which is a modified versions of 'AB 100'. The expected effect of design modifications are as follows:

- (i) The member of components will be reduced to 50.
- (ii) Direct material costs to be lower by Rs.200 per unit.
- (iii) Direct manufacturing labour costs to be lower by Rs.20 per unit.
- (iv) Machining time required to be lower by 20 per unit.
- (v) Testing time required to be lower by 20 per cent.
- (vi) Rework to decline to 5 per cent.
- (vii) Machining capacity and engineering hours capacity to remain the same.

ABC currently out sources the rework on defective units.

Required:

- (i) Compare the manufacturing cost per unit of 'AB 100' and 'AB 200'.

(ii) Determine the immediate effect of design change and pricing decision on the operating to apply to 'AB 200'.

Ignore income tax, Assume that the cost per unit of each cost driver for 'AB 100' continues to apply to 'AB 200'. (15 Marks) May/02

[Ans.: (i) Total manufacturing cost per unit of 'AB 100' Rs. 2000 and 'AB 200' is Rs. 1614.25; (ii) Operating income per month will be reduced by Rs. 1050000]

[Hint: It is to be assumed that the total available engineering hours is used for manufacturing 'AB 200' model of audio player]

Service Sector

Services sector companies provide their customers with services or intangible products. The activities of service sector may be used for both: (i) Provision of services to outside customers (ii) Provision of services internally. The types of service that may be provided, by service sector are of diverse nature and they have their own peculiarities, requirements, different cost accounting treatment but the general principles of costing discussed in earlier chapters relating to manufacturing sector will also apply to service sector.

MAIN CHARACTERISTIC OF SERVICE SECTOR:

1. **Activities are labour intensive:** The activities of service sector generally are labour intensive. The direct material cost is either small or non-existent. For example, cost of stationery used by a professional consultant for expressing an opinion in black and white, for a client will be small or even non-existent in case he gives verbal opinion. In the preceding example direct labour cost content of a service is significant.
2. **Cost-unit is usually difficult to define:** The selection of cost unit usually, for service sector is difficult to ascertain as compared to the selection of cost unit for manufacturing sector. The following table provides some examples of the cost units for service sector.

(A)	To External Customer	Cost Unit
i.	Hotel	Bed nights available, Bed night occupied
ii.	School	Student hours, Full time students
iii.	Hospital	Patient per day, Room per day
iv.	Accounting firm	Charged out client hours
v.	Transport	Passenger km., quintal km.
(B)	Internal Services	Cost Unit
i.	Staff canteen	Meals provided, No. of staff
ii.	Machine maintenance	Maintenance hours provided to user department
iii.	Computer department	Computer time provided to user department
3. **Product costs in service sector:** Costs are classified as product or period costs in manufacturing sector for various reasons. These are:
 - To determine the unit manufacturing costs so that inventories can be valued and selling prices created and verified.
 - To report production costs on income statement
 - To analyse costs for control purposes.

Differences between manufacturing and service sector.

1. The difference between manufacturing and service sector is that in service sector there is no physical product that can be stored, assembled and valued. Services are rendered and cannot be stored up or placed in a vault.
2. In service sector the cost of material is insignificant.
3. For computing unit cost of services the most important cost would be professional's labour cost.
4. The direct labour cost is traceable to service rendered.
5. In addition to labour cost the service sector like manufacturing sector incurs various overhead cost. In service sector those overhead costs, which are incurred for offering a service, are classified as service overheads (like factory overhead in manufacturing sector).
6. Examples: Rendering a loan service, representing someone in court of law or selling an insurance policy are typical services performed by professionals.

Collection of costing data in service sector

1. **Classification:** Costs are accumulated under various heads for control purpose and for decision making.
2. **Grouping:** Costs are then grouped under fixed costs and variable costs.
3. **Put in a particular format:** They are then put in a format, which depends upon the nature of industry and the need of the management.
4. **Period:** For preparing a cost sheet under operating costing, costs are usually accumulated for a specified period viz. a month, a quarter or year etc.
5. **Composite cost units:** Often composite cost units such as passenger km, bed, nights etc. are used by these organizations for ascertaining the cost of these services respectively. Since there is no

Different costing methods used in service sector:

1. **Job Costing method:** In job costing method the cost of a particular service is obtained by assigning costs to a distinct identifiable service. In service sector like Accounting firm, Advertising campaigns etc. job costing method is used.
2. **Process Costing method:** In process costing system the cost of a service is obtained by assigning costs to masses of similar unit and then computing unit cost on an average basis. Retail banking, Postal delivery, Credit card etc. uses process costing method.
3. **Hybrid costing method:** Many companies use a method of costing which is neither job costing nor process costing method. They in fact use a hybrid costing method which combines elements of both job costing and process costing methods.

Job costing method in service sector: The two costs, which are incurred in service sectors, are:

- **Direct labour**
- **Service overheads**

For ascertaining the price of a service provided by service sector if job-costing method is followed, the costs for each job are to be monitored continuously.

There are two main uses of this job costs information:

1. To guide decisions on job pricing
2. To assist in cost planning and cost control

The five steps, which are generally adopted for assigning costs to individual jobs, are as follows:

1. **Identify the job that is chosen as cost object:** For instance, litigation work for Motorola India Ltd. By Dua & Associates by assuming that work requires 100 budgeted hours of professional labour.
2. **Identify the direct cost categories for the job:** In the above example the professional hours required for doing litigation work is a direct cost.
3. **Identify indirect costs (overheads) associated with the job:** This step requires identifications of indirect costs incurred for providing services. These costs may include the costs of support labour, computer time, travel, telephone/fax machine, photocopying etc.
4. **Select the cost allocation base to be used in assigning each indirect cost to the job:** This step requires the selection of cost allocation base that has a cause and effect relationship between changes in it and changes in the level of indirect costs. The allocation base suitable for allocating indirect cost of law firm is professional labour hours.
5. **Identify the rate per unit of the cost allocation base used to allocate cost to the job:** The budgeted indirect cost allocation rate is computed by using following formula.

Customer Costing in service sector: The customer costing is a new approach to management. The theme of this approach is customer satisfaction. In some service industries such as public relations, the specific output of industry may be difficult to identify and even more difficult to quantify. Customer costing analyses the costs incurred to earn the revenues from customers. A customer cost hierarchy, categorizing the costs relating to the customers into different cost pools on the basis of different types of cost drivers or different degrees of difficulty in determining cause and effect relationship, is used. Further where there are multiple customers, identifying support activities i.e. common costs with particular customer may be more problematic. In such cases, it is important to cost customers. An ABC analysis of customers profitability provides valuable information to help management in pricing customer. Consider a banking sector A bank's activities for customer will include the following types of activities. These are:

- a) Stopping a cheque
- b) Withdrawal of cash
- c) Updation of pass book
- d) Issue of duplicate pass book
- e) Returning a cheque because of insufficient funds
- f) Clearing of a customer cheque.

Different customers or categories of customers use different amount of these activities and so customer profiles can be built up and customer can be charged according to the cost to serve them.

For example:

1. In Computer Institute the cost of providing a course for enrolled students may be determined by a variety of factors, such as type of course (Oracle or Java) and the level of course (introduction or advanced).
2. A hotel may have activities that are provided for specific types of customers such as well laid gardens, swimming pool and a bar. Older guest may appreciate and use the garden, families the swimming pool and business guests the bar. If the activities are allocated to relevant guest a correct cost per bed occupied can be calculated for each type of category.
3. A courier service where the costs to serve the customers vary with the type of service selected by customers (how fast the package is to be delivered), the destination, weight, size of package and whether the package is to be collected from customer's location or will be dropped at the office of the courier firm. The firm could use an efficient system of internet strategy to accomplish the tasks like preparing labels at the customer's site, arranging for pick up, dropping at the destination and tracking and tracing packages. The system calculates the freight charges, invoices customers daily and produces customized reports.

For customer costing purpose, the costs are divided into following categories. These are

1. **Customer Specific costs:** These are direct and indirect cost of providing service to customer plus customer related cost assigned to each customer. For example cost of express courier service to a client/customer who requests overnight delivery of some agreement.
2. **Customer-line categories:** These are the cost which are broken into the broad categories of customers and not individual customer.
3. **Company costs:** These are those costs which are not allocated to either customer line or individual customers but charge to company. The example is the cost of advertisement to promote sale of service.

Pricing by service sector

1. The service sector follows a different approach for pricing their service. Although a service has no physical existence it must be priced and billed to customers.
2. Most service organizations use a form consisting of time and material pricing to arrive at the price of a service.
3. Service companies such as appliance repair shops, automobile repair business calculate their prices by using two computations, one for labour and other for materials and parts.
4. A mark up percentage is used to add the cost of overhead to the direct cost of labour, materials and parts. If materials and parts are not part of service being performed, then only direct labour costs are used as basis for determining price.
5. For professionals such as accountants and consultants direct labour costs and apportioned overhead and indirect costs are considered for pricing.

Question 1: Give an appropriate cost unit for each of the following service sectors:

- (i) Hotel
- (ii) School
- (iii) Hospital
- (iv) Accounting firm
- (v) Transport
- (vi) Staff Canteen
- (vii) Machine maintenance
- (viii) Computer Department

(4 Marks) June/09[New Course]

Question 2: Explain which features of the Service organization may create problem for the application of activity-based costing. (4 Marks) May/05

[Ans.: The following may create problem for adoption of ABC system in service organization –

- (i) Facility sustaining costs (such as property, rents etc.) represent a significant portion of total costs and may only be avoidable if the organization ceases business. It may be impossible to establish appropriate cost drivers.
- (ii) It is often difficult to define products where they are of intangible nature. Cost objects can therefore be difficult to specify.
- (iii) Many service organizations have not previously had a costing system and much of the information required to set up a ABC system will be non-existent. Therefore introduction of ABC may be expensive.]

Question 3: Write short notes on pricing by service sector.

(3 Marks) Nov./03 & (4 Marks) Nov./05

Question 4: How will you apply customer costing in service sector? Explain with the help of a suitable example. (4 Marks) May/06

Question 5: Discuss with examples, the basic costing methods to assign costs to services. (5 Marks) May/07

Question 6: Explain the main characteristics of Service sector costing. (5 Marks) Nov./08[Old Course]

Question 7: The Bharat Hotel has annual fixed costs applicable to rooms of Rs. 7,50,000 for a 300-room hotel with average daily room rates of 50 and average variable costs of Rs. 10 for each room rented. The hotel operates 365 days per year. It is subject to an Income-tax rate of 40%.

You are required to:

- (a) Calculate the number of rooms the Hotel must rent to earn a net Income after tax of Rs.6,00,000, and
- (ii) Compute the Break-even Point in terms of number of room rented. Dec./99-ICWA

[Ans.: (i) 43750 Room days (ii) 18750 Room days]

Question 8: A hotel operated by a company has 180 single rooms and 60 double rooms. The rent of the double rooms is set at 160% of the rent of the single rooms. The operational costs per day per room are estimated as under :

	Single Rooms	Double Rooms
	Rs.	Rs.
Variable costs	300	500
Fixed costs	500	780

The average occupancy of both the single rooms and double rooms is expected to be 85% throughout a year of 365 days. In fixing the room rent, the company desires to earn a margin of safety of 20%. The hotel has to pay a tax of 20% on its tariff.

Required:

- (i) Calculate the tariff per day per (1) Single room and (2) Double room.
- (ii) The hotel intends to reserve the normal occupancy of 12 single rooms for one of its valued corporate customers at a discount (excluding tax) of 10% of the rent. What increase in the occupancy of the remaining single room days is required to compensate the loss arising from the discount. (7 Marks) May/04

[Ans.: (i) (1) Rs. 1250 (2) Rs. 2000; (ii) 532 days]

Question 9: Elegant Hotel has a capacity of 100 single rooms and 20 double rooms. It has a sports centre with a swimming pool, which is also used by persons other than resident of the hotel. The hotel has a shopping arcade at the basement and a specialty restaurant at the roof top. The following information is available:

- (i) Average occupancy: 75% for 365 days of the year.
- (ii) Current costs are:

	Variable cost	Fixed cost
	Rs./per day	Rs./per day
Single Room	400	200
Double Room	500	250

- (iii) Average sales per day of restaurant Rs. 1,00,000; contribution is at 30%. Fixed cost Rs. 10,00,000.
- (iv) The sports centre/swimming pool is likely to be used by 50 non-residents daily; average contribution per day per non-resident is estimated at Rs. 50; fixed cost is Rs. 5,00,000 per annum.
- (v) Average contribution per month from the shopping arcade is Rs. 50,000; fixed cost is Rs. 6,00,000 per annum.

You are required to find out:

- (a) Rent chargeable for single and double room per day, so that there is a margin of safety of 20% on hire of rooms and that the rent for a double room should be kept at 120% of a single room.
- (b) Evaluate the profitability of restaurant, sports centre and shopping arcade separately. Nov./97

[Ans.: (a) Single Room: Rs. 756 & Double Room: Rs. 907 (b) Rs. 9950000, Rs. 412500, Nil]

Question 10: Kangan Resorts operates a lodging house with attached facilities of a shopping arcade and restaurant on a National Highway. The following details are available:

- (i) The lodging house has 40 twin-bedded rooms, which are to be rented for Rs. 200 per night on double occupancy basis. The occupancy ratio is expected at 85% and always both the beds in the room will be occupied. The lodging facilities are operated, for 200 days in the year during foreign tourists season time only.

(ii) As per past record the spending pattern of each tourist staying in the lodge will be as under:
Rs. 50 per day in the shopping arcade and Rs. 80 per day in the restaurant.

(iii) Ratios of variable cost to respective sales volume are:

Shops	Restaurant
50%	60%

(iv) For the lodging house the variable cost on house-keeping and electricity will amount Rs. 30 per day per occupied room.

(v) Annual fixed overhead for the entire complex is estimated at Rs. 10,00,000.

Required:

(i) Prepare an income statement for the next year.

(ii) The Lodging House Manager suggests a proposal of reducing room rent to Rs. 150 per day on double occupancy basis, which will increase occupancy level to 95%. Should the proposal be accepted or not?

[Ans.: (i) Estimated Profit Rs. 931200 (ii) Proposal should not be accepted as it will result in reduction of profits by Rs. 152800] (7 Marks) May/08 & Dec./02 (ICWA Final-Adapted)

Question 11: A limited company operates a lodging house with a restaurant, shops and recreational facilities attached. Its manager has entrusted you with the planning of the coming year's operations, more particularly on the level of profits the company was likely to earn.

The lodging house has 100 double-bed room, which are likely to be rented at Rs. 150 per day. The manager expects an occupancy ratio of 75% for a period of 250 days during the tourist season. It is also anticipated that both the beds in a room will be occupied during the period.

Each person staying in the lodging house is expected to spend on the basis of past statistics Rs. 30 per day in the shops attached to the lodge and Rs. 60 per day in the restaurant. The recreational facilities are not charged to the customer.

Some other relevant data available to you is as under:

(i) Variable cost to volume ratio:

Particulars	Shops	Restaurant
Cost of goods sold	40%	30%
Supplies	5%	15%
Others	5%	10%

(ii) For lodging house, the variable costs are Rs.25 per day per occupied room for cleaning, laundry etc.

(iii) Annual fixed costs for the entire complex are Rs.19,50,000.

From the above, you are required to prepare:

(a) an income statement for the coming year; and

(b) an analysis to indicate whether the manager's suggestion of reducing the room rent to Rs.125 per day to enhance the occupancy ratio to 90% should be accepted. May/98

[Ans.: (a) Rs. 1968750, (b) Rs. 2190000]

Question 12: A company operates a hotel. It is spread over six floors of a building excluding the ground floor with a restaurant in the sixth floor. On the ground floor, the hotel operates a sports centre including a swimming pool and a shopping arcade.

The hotel has a capacity of 100 single rooms and 20 double rooms. The average occupancy of both single and double rooms is expected to be 80% throughout the year of 365 days. The rent for double room has been fixed at 125% of the rent of single room. The costs are as under:

Variable costs	:	Single rooms Rs. 220 each per day
		Double room Rs. 350 each per day
Fixed costs	:	Single rooms Rs. 120 each per day
		Double rooms Rs. 250 each per day

The income and costs relating to the service centres are as under:

(a) Restaurant:

Estimated average sales per day Rs. 25,000.

Contribution 30% of sales.

Fixed costs Rs. 8,00,000 per annum.

(b) Sports centers:

Average number of persons expected to use the centre per day is 50.

Average contribution per day per person is Rs.15.

Fixed costs Rs. 4,00,000 per annum.

(c) Shopping arcade

Average contribution per month Rs. 25,000.

Fixed costs Rs. 4,00,000 per annum.

Required:

- (i) Calculate the rent chargeable for single and double rooms per day in such a way that the hotel earns a margin of safety of 20% on hire of rooms.
- (ii) Evaluate the profitability of the three service centers and work out the total profit of the hotel per annum based on the rent recommended by you in (i) above.
- (iii) The hotel wants to reserve the normal occupancy of ten single rooms for its regular customers by allowing a discount of 10% on room rent. What increase in occupancy ratio is required in respect of the remaining rooms to earn the same profit envisaged in (ii) above.
- (iv) An associate company wishes to take the entire hotel complex on lease for a total rent of Rs.175 lacs for five years. The associate company is prepared to pay the entire lease rent in advance. Taking the Capital recovery factor for 10% return for 5 years at 3.79, advice the management of the hotel company whether or not the leasing arrangement should be entered into.

ICWA-June/91

[Ans.: (i) Single room: Rs. 460; Double room: Rs. 575; (ii) Restaurant: Rs. 1937000; Sports centre: Rs. 126250; Shopping arcade: Rs. 20000; Hotel: Rs. 5189250 (iii) 81.5% (iv) Lease is not acceptable]

Question 13: A manufacturing company runs its boiler on furnace oil obtained from X oil company and Y oil company whose depots are situated at a distance of 24 kms and 16 kms from the factory site.

Transportation of furnace oil is made by company's own tank lorries (two) of 8 ton capacity each. Onward trips are made only with full load and the lorries return empty. The filling time takes an average of 40 minutes for X oil company and 30 minutes for Y oil company. The empty time in the factory is only 40 minutes for each. The average speed of lorries work out is 24 kms per hour.

The varying operating charges average 80 paise per km covered and fixed charges gives an incidence of Rs. 7.50 per hour of operation.

Calculate the transportation cost per ton-km for each source of furnace oil.

(8 Marks) Nov/04

[Ans.: X-Rs. 0.33, Y-Rs. 0.347]

Question 14: You are required to calculate a suggested fare per passenger/km. from the following information for a Mini Bus:

- (b) Length of route: 30km.
- (c) Purchase price Rs. 4,00,000.
- (d) Part of above cost met by loan, annual interest of which is Rs. 10,000 p.a.
- (e) Other annual charges: Insurance Rs. 15,000, Garage rent Rs. 9,000, Road Tax Rs. 3,000, Repairs & maintenance Rs. 15,000, Administrative charges Rs. 5,000.
- (f) Running Expenses: Driver & Conductor Rs. 5,000 p.m., Repairs/Replacement of tyre-tube Rs. 3,600 p.a, Diesel and oil cost per km.Rs.5.
- (g) Effective life of vehicle is estimated at 5 years at the end of which it will have a scrap value of Rs. 10,000.
- (h) Mini Bus has 20 seats and is planned to make six no .two-way trips for 25 days p.m.
- (i) Provide profit @ 20% of total revenue.

(15 Marks) Nov./97

[Ans.: Rate per passenger km. 0.43 paise]

Question 15: A Cement Company transports its requirement of limestone from a quarry situated at a distance of 6 km from the factory. Presently the company engages transport contractors for the purpose .The Company has invited tenders from the local transport contractors and the lowest quotation received is Rs.18 per tonne of limestone.

The Management is concerned about the increasing cost of transport and has, therefore under its consideration has proposal for the purchase of a fleet of trucks for being used departmentally for the transport of limestone. You have been furnished with the following data to examine the feasibility of the proposal.

- (i) The company has two options regarding purchases of trucks. They are (a) buy 10 tonne capacity trucks or (b) buy 8 tonne capacity trucks.
- (ii) Operation cost data:

Particulars	10 Tonne capacity trucks	8 Tonne capacity trucks
Purchase price of each truck (Rs.)	4,30,000	4,00,000
Life in years	5	5
Scrap value at the end of 5 th year of life. (Rs.)	82,000	40,000
Km. per liter of diesel	3	4
Repairs and maintenance		
Per annum per truck	47,100	38,400

	Road Tax per quarter per truck	(Rs.)	600	600
	Miscellaneous fixed expenses per month	(Rs.)	3,000	3,000
	Oil and sundries per 100 km run	(Rs.)	10	10
(iii)	Each truck will make 5 trips (to and fro) on an average for 24 days month.			
(iv)	Cost of diesel a Rs.10m per liter.			
(v)	Salary of drivers Rs.1,600 per month.			
	Two extra drivers will be employed to work as relievers.			
(vi)	Other staff required			
	One Mechanic		@ Rs.2,000 per month	
	One Fitter		@ Rs.1,600 per month	
	One Supervisor		@ Rs.3,200 per month.	
(vii)	The capacity of the cement plant is 24,000 tonnes per month of limestone crush.			

Required:

- Present a comparative cost sheet on the basis of the aforesaid data showing the transport cost per tonne of operating 10 tonne and 8 tonne capacity trucks at full capacity utilization of the cement plant for an average month by classifying the expenses into (a) varying with km run (b) varying with number of trucks and (c) fixed, and suggest the best alternative out of the three choices available namely (a) selection from two capacity trucks and (b) hiring of transportation.
- Apart from cost analysis as in (i) above, what other factors may be considered by the management before accepting the proposal for purchase of trucks. ICWA-Dec./91

[Ans.: Cost/Tonne: 10 Tonne trucks-Rs. 14.27; 8 Tonne trucks-Rs. 15.90; Hire Charges-Rs. 18.00]

Question 16: A Company presently brings coal to its factory from a nearby yard and the rate paid for transportation of coal from the yard located 6km. away to factory is Rs.50 per tonne. The total coal to be handled in a month is 24,000 tonne.

The Company is considering proposal to buy its own truck and has the option of buying either a 10 tonne capacity or a 8 tonne capacity truck.

The following information's are available:

Particulars	10 Tonne Truck	8 Tonne Truck
Purchase price	10,00,000	8,50,000
Life (year)	5	5
Scrap value at the end of the 5 th year	Nil	Nil
Km per liter of diesel	3	4
Repair/ Main. p.a. per truck	60,000	48,000
Other Fixed Expenses p.a	60,000	36,000
Lubricants & sundries per 100 km	20	20

Each truck will daily make 5 trips (to and fro) on an average for 24 days in month cost of Diesel Rs.15 per liter. Salary of Drivers Rs.3, 000 per month- Two Drivers will be required for a Truck.

Other Staff expenses Rs.1, 08,000 p.a.

Present a comparative Cost Sheet on the basis of the above data showing transport cost per tonne of operating 10 tonne and 8 tonne Truck at full capacity utilization. (12 Marks) Nov./98

**[Ans.: Truck capacity 10 Tonne 8 Tonne
Cost per tonne (Rs.) 29.87 31.59]**

Question 17: Modern Airways owns a single jet aircraft and operates between EXETOWN and WYETOWN. Flights leave EXETOWN ON Mondays and Thursdays and depart from WYETOWN on Wednesdays and Saturdays Modern Airways cannot afford any more flights between EXETOWN and WYETOW. Only tourist class seats are available on its flights. An analyst has collected the following information:

Seating capacity per plane	360
Average passengers per flight	200
Flights per week	4
Flights per year	208
Average on-way fare	Rs.5,000
Variable fuel costs	Rs.1,40,000 per flight
Food service to passengers (not charged to passengers)	Rs.200 per passenger
Commission paid to travel agents paid by Modern Airways on each ticket booked on Modern Airways. (Assume that all Modern Airways tickets are booked by travel agents)	8% of fare

Fixed annual lease costs allocated to each flight	Rs.5,30,000 per flight
Fixed ground services (maintenance, check-in, baggage handling) costs allocated to each flight	Rs.70,000 per flight
Fixed salaries of flight crew allocated to each flight	Rs.40,000 per flight

For the sake of simplicity, assume that fuel costs are unaffected by the actual number of passengers on flight
Required:

- What is the operating income that Modern Airways makes on each one-way flight between EXETOWN and WYETOWN?
- The market research department of Modern Airways indicates that lowering the average one-way fare to Rs.4,800 will increase the average number of passengers per flight to 212. Should Modern Airways lower its fare?
- Zed Tours and Travels, a tour operator, approaches Modern Airways to charter its jet aircraft twice each month, first to take Zed's international tourists from EXETOWN TO WYETOWN and then bring the tourists back from WYETOWN TO EXETOWN. If Modern Airways accepts the offer, it will be able to offer only 184 (208 minus 24) of its own flights each year. The terms of the charter are:
 - For each one-way flight zed will pay Modern Rs.7,50,000 to charter the plane and to use its flight crew and ground services staff.
 - Zed will pay for fuel costs.
 - Zed will pay for all food costs.

On purely financial considerations, should Modern Airways accept the offer from Zed Tours and Travel? What other considerations should Modern Airways consider in deciding whether or not charter its plane to Zed Tours and Travels? May/98

[Ans.: (a) Rs. 100000; (b) Excess contribution due to lowering of fare is Rs. 13792; (c) Reduction in contribution is Rs. 3792]

Question 18: In order to develop tourism, Reliable Airline has been given permit to operate three flights to and fro in a week between Station A and Station B. The airline operates a single aircraft of 160 seats capacity. The normal occupancy is estimated at 60% throughout the year of 52 weeks. The one way fare is Rs.7, 000.

The costs of operation of flights are:

Fuel cost variable	Rs.95,000 per flight
Food served on board on non-chargeable basis	Rs.130 per passenger
Fixed costs:	
Aircraft lease	Rs. 3,50,000 per flight
Crew, landing charges etc.	Rs.72,000 per flight
Commission	5% of fare applicable for all bookings.

Required:

- Calculate the net operating income per flight.
- The airline expects that its occupancy will increase to; 108 passengers per flight if the fare is reduced to Rs.6, 720. Advise whether this proposal should be implemented.
- A travel agency firm proposes to charter the aircraft for one return trip (to and fro) in each month on payment of a fixed charge of Rs.5 lakhs per flight.

The travel agency firm will meet the fuel and food costs. Should the airline accept this proposal?

[Ans.: (i) Rs. 108920; (ii) Rs. 580432; (iii) Rs. 30920]

Question 19: A private university with a current enrolment of 12,000 students is reviewing cost and revenue data for the past academic year. Student tuition is Rs.3, 600 a year. Tuition normally covers 75 per cent of university expenditures. The remaining 25 per cent comes from endowments and contributions. During the last academic year fixed costs amounted to Rs.300 lakhs. The rest of the costs varied with student enrolment. Costs have been rising more rapidly than tuition or contributions, and the university just broke even last year. A tuition increase is being contemplated. The budget committee thinks endowment revenues and contributions will remain constant at last year's level for the next several years.

The fixed costs are expected to increase by Rs.30 lakhs and the variable costs are expected to increase by 10 per cent. The president of the university tells the budget committee that he expects a new grant of Rs.50 lakhs in addition to the normal contributions for each of the next 5 years from a large corporation owned by an alumnus of the university. The university has been postponing a number of major capital improvements and building projects.

Required:

- (i) If the grant is received and tuition is raised to Rs.4, 200, how much money would the university have available in the first year for capital improvements and building with student enrolment of 11,200 and the expected cost increases?.
- (ii) If the grant is received and costs increases as predicted for the coming year, what tuition should the university charge to break-even with its current enrolment of 12,000 students after providing Rs.40.40 lakhs for capital improvements?

[Ans.: Rs. 5104000; Rs. 4000 per student]

Question 20: DD amusement Park charges Rs.4 each for all rides in the park. Variable costs amount to Rs.0.80 per ride and fixed costs are Rs.32, 00,000. Last year's net income was Rs.6, 40,000 on sales of Rs.48, 00,000. Rising costs have cut sharply into net income for DD for the last 2 years. This year management again expects a cost increase of 25 per cent in variable costs and 10 per cent in fixed costs. To help offset these increases, the management is considering raising the price of a ride to Rs.5.

Required:

- (i) How many rides did DD sell last year?
- (ii) If the price increase is not implemented, what is the expected net income from this year assuming the same volume of activity?
- (iii) Compute the price in difference point for the new ride price.
- (iv) Compute the Break-even point for this year using the old price and the new price.
- (v) Should management raise the price of a ride, if the price increase will reduce ride volume 10 per cent from the last years' level? In that situation, what will be the expected net income?

[Ans.: (i) 1200000; (ii) 80000 (iii) 1040000 (iv) At old price: 1173334; At new price: 880000 (v) 800000]

Question 21: A city health centre provides health and other related services to the citizens who are covered under insurance plan. The health centre receives a payment from the insurance company each time any patient attends the centre for consultation as under:

Consultations involved	Payment from Insurance company
	Rs.
No treatment	60
Minor treatment	250
Major treatment	500

In addition, the adult patients will have to make a co-payment which is equivalent to the amount of payment for the respective category of treatment made by the insurance company. However, children and senior citizens are not required to make any such co-payment.

The health centre will remain open for 6 days in a week for 52 weeks in a year. Each physician treated 20 patients per day although the maximum number of patients that could have been treated by a physician on any working day is 24 patients.

The health centre received a fixed income of Rs. 225280 per annum for promotion of health products from the manufacturers.

The annual expenditure of the health centre is estimated as under:

Materials and consumables (100% variable)	Rs. 2232000
Staff salaries per annum per employee (fixed):	
Physician	Rs. 450000
Assistants	Rs. 150000
Administrative staff	Rs. 90000
Establishment and other operating costs (fixed)	Rs. 1600000

The non-financial information is as under

(i) Staff:	
No. of physicians employed	6
Assistants	7
Administrative staff	2
(ii) Patient Mix:	
Adults	50%
Children	40%
Senior Citizens	10%
(iii) Mix of patients appointments (%)	
Consultation requiring no treatment	70%
Minor treatment	20%
Major treatment	10%

Required:

- (a) Calculate the Net Income of the city health centre for the next year.
- (b) Determine the percentage of maximum capacity required to be utilized next year in order to break even.

(8 Marks) Nov./08-Old Course

[Ans.: (i) Rs. 438000 (ii) 77%]

[Assumption: Patient mix and mix of patient appointments will be same in the next year.]

Question 22: A Multinational company runs a Public Medical Health Centre. For this purpose, it has hired a building at a rent of Rs. 10,000 per month with 5% of total taking*. Health centre has three types of wards for its patients namely. General ward, Cottage ward and Deluxe ward. State the rent to be charged to each bed-day for different type of ward on the basis of the following information:

- (i) The number of beds of each type are General ward 100, Cottage ward 50, Deluxe ward 30.
- (ii) The rent of Cottage ward bed is to be fixed at 2.5 times of the General ward bed and that of Deluxe ward bed as twice of the Cottage ward bed.
- (iii) The occupancy of each type of ward is as follows:
General ward 100%, Cottage ward 80% and Deluxe ward 60%. But, in general ward there were occasions when beds are full, extra beds were hired at a charges of Rs. 20 per bed. The total hire charges for the extra beds incurred for the whole year amount to Rs. 12,000.
- (iv) The Health Centre engaged a heart specialist from outside and on an average fees paid to him was Rs. 15,000 per trip. He makes three trips in the whole year.
- (v) The other expenses for the year were as under:

	Rs.
Salary of Supervisors, Nurses, Ward boys	4,25,000
Repairs and maintenance	90,000
Salary of doctors	13,50,000
Food supplied to patients	40,000
Laundry charges for their bed linens	80,500
Medicines supplied	74,000
Cost of oxygen, X-ray etc. other than directly borne for treatment of patients	49,500
General administration charges	63,000

- (vi) Provide profit @ 20% on total taking*.

- (vii) The Health Centre imposes 8% service tax on rent received.

- (viii) 360 days may be taken in a year.

(12 Marks) Nov./06

[Ans.:	General ward	Rs. 32.22	Rs. 33.10*
	Cottage ward	Rs. 80.55	Rs. 82.76*
	Deluxe ward	Rs. 161.08	Rs. 165.51*

*If total taking includes Service Tax]

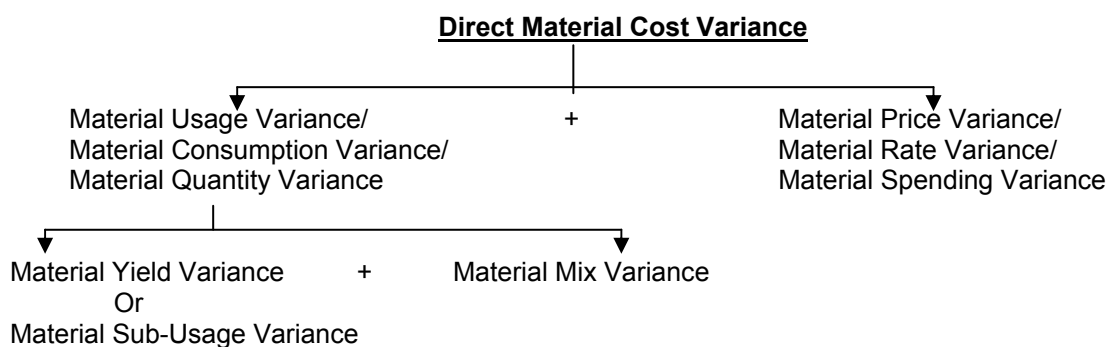
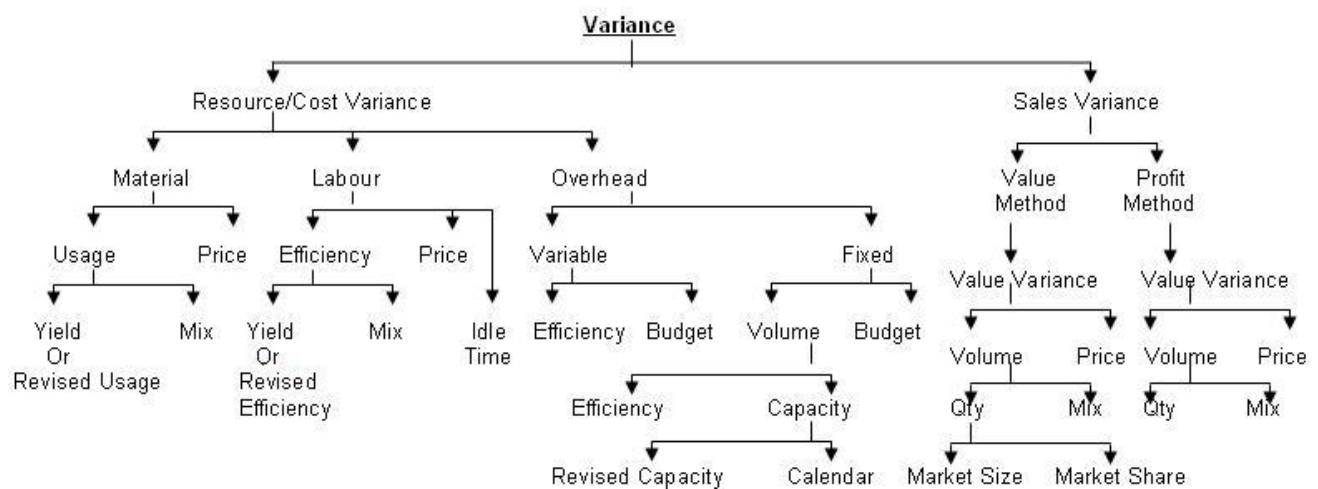
Standard Costing

CIMA defines standard cost as "a standard expressed in money. It is built up from an assessment of the value of cost elements. Its main uses are providing bases for performance measurement, control by exception reporting, valuing stock & establishing selling price."

The term **static budget** refers to the budget that is prepared at the **beginning** of the budgeting period and is **valid for only the planned level of activity**.

A **flexible budget** provides estimates of what costs should be for **any level of activity** within a specified range.

A static budget is **suitable for planning**, but it is inadequate for evaluating how well costs are controlled because the actual level of activity is unlikely to equal the planned level of activity, thus resulting in "**apples-to-oranges**" cost comparisons. Flexible budget, when used for performance evaluation purposes, actual costs are compared to **what the costs should have been for the actual level of activity** during the period. This enables "apples-to-apples" cost comparisons.



1. Total Material Cost Variance (TMCV)

$$\text{TMCV} = (\text{Standard Qty} \times \text{Standard Rate}) - (\text{Actual Qty} \times \text{Actual Rate})$$

OR

$$= \text{Standard Cost for Actual Output} - \text{Actual Cost for Actual Output}$$

2. Material Usage Variance (MUV)

$$\text{MUV} = (\text{Standard Qty for Actual Output} - \text{Actual Qty} \times \text{Standard Rate})$$

3. Material Price Variance (MPV)

$$\text{MPV} = [\text{Standard Price (Rate)} - \text{Actual Price (Rate)}] \times \text{Actual Quantity}$$

^a**Note:** [There are two approaches of taking Actual Quantity while calculating TMCV & MPV. (i) Quantity is taken as quantity purchased (ii) Quantity is taken as quantity used.

Remember, since price variance is reported in the period in which it is incurred it is recommended to use quantity purchased approach.

If quantity purchase is not equal to quantity used then, $TMCV \neq MUV + MPV$

4. **Material Yield Variance (MYV)**

$MYV = (\text{Actual Output/Yield} - \text{Std. Output for Actual Mix}) \times \text{Std. price per unit of output}$
 $= (\text{Actual Output} - [c]) \times [b]$

Where, Std. price per unit of Output = $\frac{\text{Total Standard Cost of Input}}{\text{Total Standard Output}}$

OR

Material Sub-Usage Variance (MSUV)

$MSUV = (\text{Std. Quantity for actual output} - \text{Revised Std. Quantity}) \times \text{Standard Price}$

Revised Standard Qty = $\frac{\text{Total Qty of Actual Mix} \times \text{Std. Qty}}{\text{Total Qty in Std. Mix}}$

5. **Material Mix Variance (MMV)**

Main Formula:

$MMV = (\text{Revised Standard Quantity} - \text{Actual Quantity}) \times \text{Standard Price}$

Rarely used Alternate Formula:

$MMV = (\text{Std. Rate of Std. Mix} - \text{Std. Rate of Actual Mix}) \times \text{Total Actual Mix}$

Where, Std. Rate of Std. Mix = $\frac{\text{Total Std. Cost for Actual Output}}{\text{Total Std. Quantity}}$
 &, Std. Rate of Actual Mix = $\frac{\text{Total Actual Qty at Std. Rate}}{\text{Total Actual Qty}}$

- All Material Variances save Yield Variance are calculated as Std. – Actual. Yield Variance is calculated as Actual – Std.
- All Material Variances save Yield Variance are calculated on Input quantity. Yield Variance is calculated for Production.

Question 1: Actual Output is 90 units, Standard mix for material A, B, & C is 50%, 30%, & 20% @ Rs. 2 per kg, Rs. 3 per kg and Rs. 4 per kg respectively. Standard Normal Loss is 10%. Actual quantity used is 60 kgs @ Rs. 4 per kg of A, 50 kgs @ Rs. 2 per kg of B, & 10 kgs @ Rs. 3 per kg of C. Calculate all material variances.

[Ans.: MCV: 100A; MPV: 60A; MUV: 40A; MMV: 14F; MYV: 54A]

Question 2: A Ltd. produces an article by blending 3 raw materials. The following standards have been set up for raw materials:

Material	Standard Mix	Standard Price (Rs. per kg.)
A	40%	4
B	60%	3

The standard loss in processing is 15%. During Sept'08, the company produces 1700 units of finished goods. The position of stock and purchases for the month of Sept'08 is as under:

Material	Stock on 1-9-08	Stock on 30-9-08	Purchases during Sept'08	
			Kg.	Cost Rs.
A	35	5	800	3400
B	40	50	1200	3000

Calculate all material variances. Assume FIFO for the issue of material. The opening stock is to be valued at standard price.

[Ans.: MUV: 90A; MMV: 22A; MYV: 68A; On the basis of purchase - MCV: 400F; MPV: 400F; On the basis of usage - MCV: 286F; MPV: 376F]

Question 3: The standard set for a chemical mixture of a firm is as under:

Material	Standard mix %	Standard price per kg (Rs.)
----------	----------------	-----------------------------

A	40	60
B	60	30

The standard loss in production is 10 %. During a period, the actual consumption and price paid for a good output of 182 kg. are as under:

Material	Quantity in kg.	Actual price per kg (Rs.)
A	90	18
B	110	34

Calculate the variances.

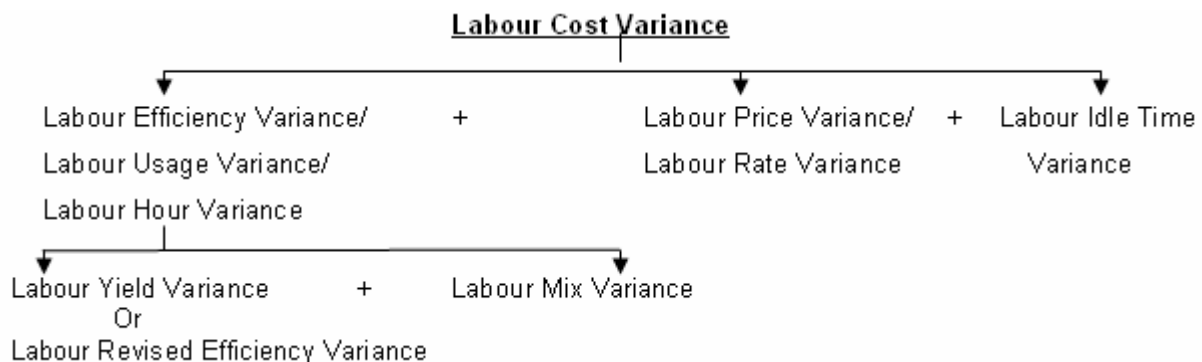
[Ans.: MCV: 3100F; MPV: 3340F; MUV: 240A; MMV: 300A; MYV: 93F]

Question 4: The standard quantity of material required is 4 kgs. per unit of actual output. The relevant figures are as under :

Material	A	B	C	D
Standard mix %	30%	40%	20%	10%
Price per kg. (Rs.)	1.25	1.50	3.50	3.00
Actual qty. used (Kg.)	1,180	1,580	830	440
Actual price per kg. (Rs)	1.30	1.80	3.40	3.00
Actual output: 1,000 units				

Calculate price variance, mix variance, sub-usage variance and total material cost variance.

[Ans.: MCV: 620A; MPV: 450A; MUV: 170A; MMV: 110.75A; MYV: 59.25A]



1. Labour Cost Variance (LCV):

LCV = Standard Labour Cost – Actual Labour Cost

OR

= (Standard Hours × Standard Rate) – (Actual Hours^b × Actual Rate)

2. Direct Labour Efficiency Variance (LEV):

LEV = (Standard Hours for actual output – Actual Hours^b) × Standard Rate

3. Labour Rate Variance (LRV):

LRV = (Standard Rate – Actual Rate) × Actual Hours^b

4. Idle Time Variance (ITV):

ITV (Always Adverse) = Idle Hours × Standard Rate

^b**Note:** In case we are not supposed to calculate idle time variance then we will calculate 3 labour variances (i.e. Labour Cost, Rate & Efficiency variance) at actual hours worked otherwise, Labour Cost & Rate variance will be calculated on actual hours paid basis & efficiency variance is calculated on actual hours worked basis.

5. Labour Yield Variance (LYV)

LYV = (Actual Output/Yield – Std. Output for Actual Mix of Labour Worked) × Std. price per unit of output

Where,

$$\text{Std. price per unit of Output} = \frac{\text{Total Standard Cost of Input Labour Hours}}{\text{Total Standard Output}}$$

OR

Labour Revised Efficiency Variance (LREV)

$$\text{LREV} = (\text{Std. Hours for actual output} - \text{Revised Std. Hours } \underline{\text{Worked}}) \times \text{Standard Price}$$

$$\text{Revised Standard Hrs.} = \frac{\text{Total Hrs } \underline{\text{Worked of Actual Mix}} \times \text{Std. Hrs.}}{\text{Total Hrs. in Std. Mix}}$$

6. Labour Mix Variance (Gang Variance) or (Composite Variance):

$$\text{LMV} = (\text{Revised Std. Hrs. } \underline{\text{Worked}} - \text{Actual Hours } \underline{\text{Worked}}) \times \text{Standard Price}$$

- Actual Hours Worked = Actual Hours Paid – Idle Time
- All Labour Variances save Yield Variance are calculated as Std. – Actual. Yield Variance is calculated as Actual – Std.
- All Labour Variances save Yield Variance are calculated on Input hours. Yield Variance is calculated for Production.

Question 5: 100 skilled workmen, 40 semi-skilled workmen and 60 unskilled workmen were to work for 30 weeks to get a contract job completed. The standard weekly wages were Rs. 60, Rs. 36 and Rs. 24 respectively. The job was actually completed in 32 weeks by 80 skilled, 50 semi-skilled and 70 unskilled workmen who were paid Rs. 65, Rs. 40 and Rs. 20 respectively as weekly wages.

Find out the labour cost variance, labour rate variance, labour mix variance and labour efficiency variance.

[Ans.: LCV: 8800A; LRV: 10240A; LEV: 1440F; LMV:19200F]

Question 6: Given the following data, compute the variances.

	Skilled	Semi-Skilled	Unskilled
Number of workers in standard gang	16	6	3
Standard rate per hour	3	2	1
Actual number of workers in the gang	14	9	2
Actual rate of pay per hour (Rs.)	4	3	2

In a 40- hour week, the gang as a whole produced 900 standard hours.

[Ans.: LCV: 1212A; LRV: 1000; LREV: 252A; LMV:40F]

Question 7: A firm gives you the following data:

Standard time per unit	2.5 hours
Actual hours paid	2,000 hours
Standard rate of pay	Rs. 2 per hour
25 % of the actual hours has been lost as idle time.	
Actual output	1,000 units
Actual wages	Rs. 4,500

Calculate the idle time variance.

[Ans.: LCV: 500F; LRV: 500A; LEV: 2000F; ITV: 1000A; LYV: 2000F]

Question 8: The following details are available from the records of A Ltd. engaged in manufacturing article A for the week ended 28th Feb.

Particulars	Hours	Rate per hour (Rs.)	Total
Skilled labour	10	3	30
Semi-skilled labour	8	1.50	12
Unskilled labour	16	1	16
			58

The actual production was 1000 articles A for which the actual hours worked and rates are given below:

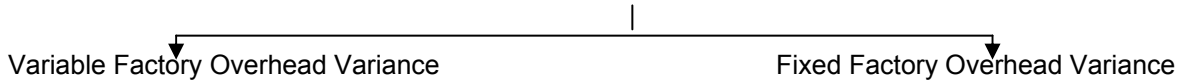
Particulars	Hours	Rate per hour (Rs.)	Total
Skilled labour	9000	4	36000
Semi-skilled labour	8400	1.50	12600
Unskilled labour	20000	0.90	18000

66600

From the above set of data, you are asked to calculate: (i) Labour cost variance (ii) Labour rate variance (iii) Labour efficiency variance (iv) Labour yield variance (v) Labour mix variance.

[Ans.: 8600 (A), 7000 (A), 1600(A), 5800 (A), 4200 (F)]

FACTORY OVERHEAD VARIANCE

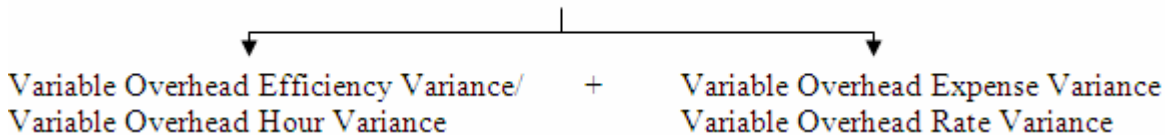


- Overheads are usually measured in relation to output if details of input quantities on which these variable overheads have been incurred are not readily available.
- Overheads are calculated on Actual Hours/Days **Worked**.
- Under-absorption = Adverse Variance & Over-absorption = Favourable Variance
- Remember if Cost-allocation base is specified, we will only take the specified cost allocation for absorption purpose otherwise, if question is silent, Variable overheads are absorbed on actual hours.

1) Std. Overhead Rate per unit	=	$\frac{\text{Budgeted Overheads}}{\text{Budget Output}}$
2) Std. Overhead Rate per hour	=	$\frac{\text{Budgeted Overheads}}{\text{Budget Hours}}$
3) Std. Hours for actual output	=	$\frac{\text{Budgeted Hours} \times \text{Actual Output}}{\text{Budgeted Output}}$
4) Std. Output for actual time	=	$\frac{\text{Budgeted Output} \times \text{Actual Hours}}{\text{Budgeted Hours}}$
5) Recovered/Absorbed Overheads	=	Std. Rate per unit $\times$ Actual Output Std. Rate per hour $\times$ Std. Hours for actual output
6) Budgeted Overheads	=	Std. Rate per unit $\times$ Budgeted Output Std. Rate per hour $\times$ Budgeted hours
7) Standard Overheads	=	Std. Rate per hour $\times$ Actual Hours Std. Rate per unit $\times$ Std. Output for actual time
8) Possible Overheads	=	Std. Rate per day $\times$ Actual Days Std. Rate per hour $\times$ Std. hrs. per day $\times$ Actual Days
9) Actual Overheads	=	Actual Rate per unit $\times$ Actual Output Actual Rate per hour $\times$ Actual Hours

○ Variable Factory Overhead

Variable Cost Variance



1. Variable Overhead Cost Variance (VOCV):

VOCV = Standard Cost – Actual Cost

2. Variable Overhead Efficiency Variance (VOHV):

VOHV = (Budgeted units of variable overhead cost allocation base allowed for actual output - Actual units of variable overhead cost allocation base for actual output) $\times$ Budgeted Variable Overhead Rate
= (Standard Hours for actual output – Actual Hours) $\times$ Standard Rate

3. Variable Overhead Expense Variance (VOEV):

VOEV = (Budgeted Variable Overhead Rate - Actual Variable Overhead Rate) $\times$ Actual units of variable overhead cost allocation base for actual output
= (Standard Rate – Actual Rate) $\times$ Actual Hours

Question 9: XYZ Company has established the following standards for variable factory overhead.

Standard hours per unit : 6

Variable overhead per hour : Rs. 2/-

The actual data for the month are as follows:

Actual variable overheads incurred Rs. 2,00,000

Actual output (units) 20,000

Actual hours worked 1,12,000

Required:

Calculate variable overhead variances viz :

- (i) Variable overhead variance.
- (ii) Variable overhead budget variance.
- (iii) Variable overhead efficiency variance.

[Ans.: (i) 40000F; (ii) 24000F; (iii) 16000F]

Question 10: The following information has been extracted from the books of Goru Enterprises which is using standard costing system:

Actual output = 9,000 units
Direct wages paid = 1,10,000 hours at Rs.22 per hour, of which 5,000 hours, being idle time, were not recorded in production

Standard hours = 10 hours per unit

Labour efficiency variance = Rs. 3,75,000 (A)

Standard variable Overhead = Rs. 150 per unit

Actual variable Overhead = Rs. 16,00,000

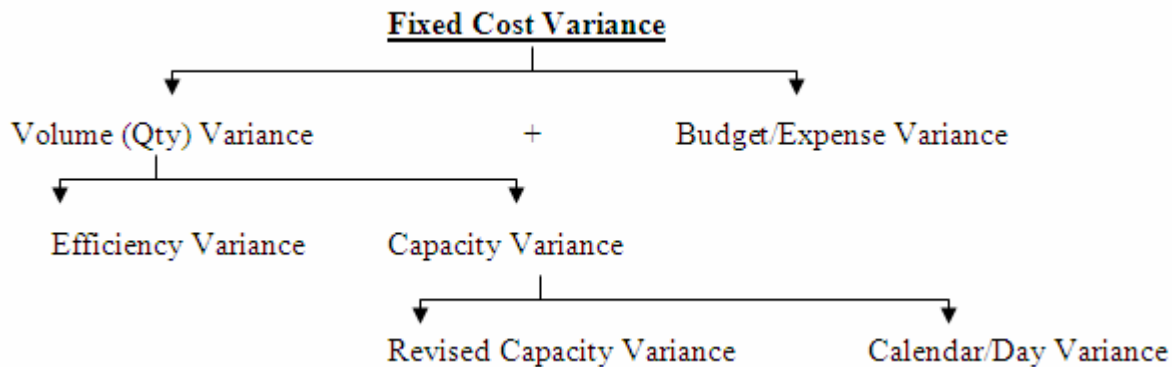
You are required to calculate:

- (i) Idle time variance
- (ii) Total variable overhead variance
- (iii) Variable overhead expenditure variance
- (iv) Variable overhead efficiency variance

[Ans.: (i) 125000A, (ii) 250000A (iii) 25000A (iv) 225000A]

(6 Marks) May/08

○ **Fixed Overhead Variance**



- In case we are supposed to calculate Calendar Variance then we will calculate Revised Capacity Variance along with Calendar Variance but will name it as Capacity Variance rather than Revised Capacity Variance. We will not calculate capacity variance in such case.
- If we are specifically asked to calculate Idle Time Variance then we will calculate Capacity Variance at Actual Hours **paid** in spite of **worked**. All other variance will remain same.

1. **Fixed Overhead Cost Variance (FOCV):**

FOCV = Absorbed Overhead – Actual Overhead

2. **Fixed Overhead Volume Variance (FOVV):**

FOVV = Absorbed Overhead – Budgeted Overhead

3. **Fixed Overhead Budget Variance (FOBV):**

$$\text{FOBV} = \text{Budgeted Overhead} - \text{Actual Overhead}$$
4. **Fixed Overhead Efficiency Variance (FOEV):**

$$\text{FOEV} = \text{Absorbed Overhead} - \text{Standard Overhead}$$

$$= (\text{Std. Hours for Actual Output} - \text{Actual Hrs **Worked**}) \times \text{Std. Overhead per Hour}$$
5. **Fixed Overhead Capacity Variance (FO Cap V):**

$$\text{FO Cap V} = \text{Standard Overhead} - \text{Budgeted Overhead}$$

$$= (\text{Actual Hrs} - \text{Budgeted Hours}) \times \text{Std. Overhead per hour}$$
6. **Fixed Overhead Revised Capacity Variance (FORCV):**

$$\text{FORCV} = \text{Standard Overhead} - \text{Possible Overhead}$$

$$= (\text{Actual Hrs per Day} - \text{Std. Hrs. per Day}) \times \text{Actual Days **Worked**} \times \text{Std. Overhead per hour}$$
7. **Fixed Overhead Day/Calendar Variance (FODV):**

$$\text{FODV} = \text{Possible Overhead} - \text{Budgeted Overhead}$$

$$= (\text{Actual Days **Worked**} - \text{Std. Days}) \times \text{Std. Hours per Day} \times \text{Std. Overhead per hour}$$

$$= (\text{Actual Days **Worked**} - \text{Standard Days}) \times \text{Standard Overhead per Day}$$

Question 11: Budgeted No. of working days 24
 Budgeted No. of hours per month 12,000
 Fixed overhead rate Re.0.50 per hour
 Actual No. of working days in June 25
 Compute the calendar variance

[Ans.: FODV: 250F]

Question 12: Assuming the expenses to be fixed, calculate from the following data:
 (a) Efficiency variance, (b) Volume variance, (c) Calendar variance and (d) Expense variance

	Budget	Actual
No. of working days per month	20	22
Man hours per day	8,000	8,400
Output per man hour in units	1.0	1.2
Standard overhead rate per man hour	Rs.2	
Actual fixed expenses per month		Rs.3,25,000

[Ans.: (a) 73920F; (b) 123520F; (c) 32000F; (d) 5000A]

Question 13: You are given the following data:

	Budgeted	Actual
Fixed overhead for July	Rs.10,000	Rs. 10,200
Units of production in July	5,000	5,200
Standard time for one unit	4 hours	
Actual hours worked	20,100 hours	

Calculate all variances relating to fixed overheads

[Ans.: FOCV: 200F; FOBV: 200A; FOVV: 400F; FO Cap V:50F; FOEV: 350F]

Question 14: ABC limited provides the following information for April, 2002:

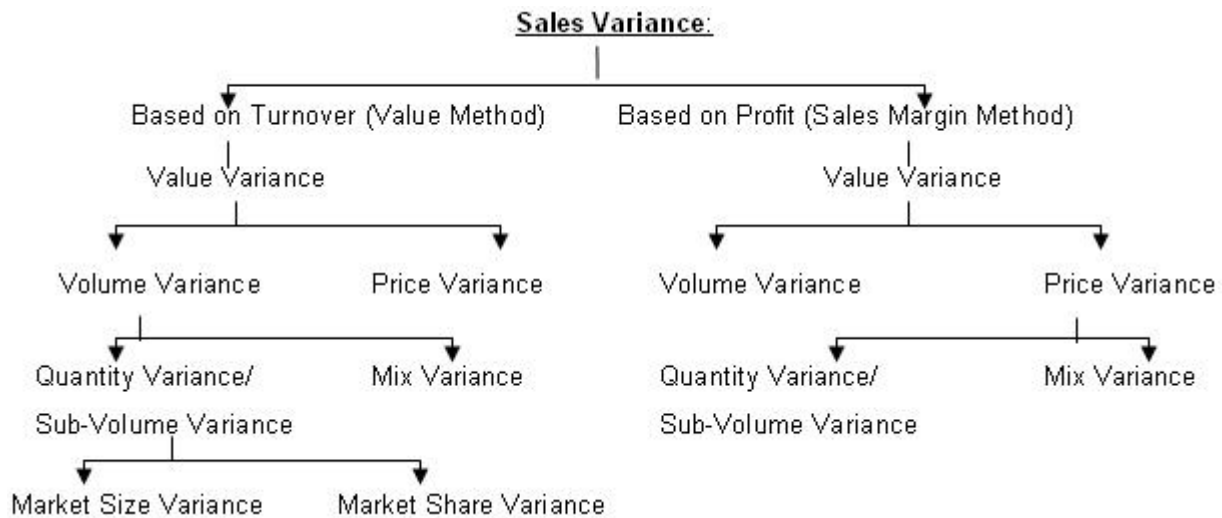
	Budget	Actual
Number of working day	20	21
Man hours	40,000	43,000
Output per manhour (unit)	3.2	3.0
Overhead – Fixed (Rs.)	32,000	31,500
Variable (Rs.)	1,02,400	1,14,400

Required

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For notes/updates/amendments on all subjects log on: <http://groups.yahoo.com/group/costingbyparaggupta>

Compute variable overhead, fixed overhead variance and total overhead variance (12 Marks) May/2002
[Ans.: Total variable overhead variable Rs 11,200A; Variable overhead expenditure variance Rs 4320A; Variable overhead efficiency variance Rs 6,880A; Fixed overhead expenditure variance Rs 500F; Fixed overhead volume variance Rs 250F ; Fixed overhead efficiency variance Rs 2150A; Fixed overhead capacity variance Rs 800F ; Calendar variance Rs 1600F; Total overhead variance Rs 10450A]



Sales Variances are calculated in same way as that of Material Variances save Material Variances are calculated as Std. – Actual & Sales variances are calculated as Actual – Std.

Based on Turnover:

1. Sales Value Variance (SVV)

SVV = Actual Sales - Budgeted Sales

2. Sales Volume Variance (S Vol V)

SVV = Standard Sales - Budgeted Sales
 = (Actual Sales Qty - Budgeted Sales Qty) × Standard Sale Price

3. Sales Price Variance (SPV)

SPV = Actual Sales - Standard Sales
 = [Actual Price (Rate) - Standard Price (Rate)] × Actual Quantity Sold

4. Sales Mix Variance (SMV)

SMV = Std. Sales - Revised Std. Sales

Based on Quantity : Products are Homogenous (Better Approach)
 SMV = (Actual Qty sold - Revised Std. Quantity) × Standard Selling price
 Where, Revised Std. Qty. = $\frac{\text{Total Qty of Actual Mix} \times \text{Std. Quantity}}{\text{Total Quantity of Std. Mix}}$

Based on Value : Products are not Homogenous
 SMV = Std. Sales - Revised Std. Sales

Where, Revised Std. Sales = Budgeted Ratio of Sales × Std. Sales
 & Budgeted Ratio of Sales = Budgeted Sales of Product

Total Budgeted Sales

5. Sales Quantity Variance (SQV)

$$\text{SQV} = \text{Revised Std. Sales} - \text{Budgeted Sales}$$

Based on Profit:

These are exactly same as sales variance (based on turnover). Std. Selling Price is replaced with Std. Margin & Actual Selling Price by Actual Margin, but Std. Margin = Std. Selling Price – Std. Cost & Actual Margin = Actual Selling Price – **Standard Cost**

Question 15: Compute the sales turnover variances from the following figures: -

Product	Budget		Actual	
	Quantity	Price Rs.	Quantity	Price Rs.
A	2,000	2.50	2,400	3.00
B	1,500	5.00	1,400	4.50
C	1,000	7.50	1,200	7.00
D	500	10.00	400	10.50

[Ans.: SVV: 1100F; SPV: 100F; S Vol V: 1000F; SMV: 1000A; SQV: 2000F]

Question 16: A Trident Toys Ltd. had drawn up the following sales budget for august , 2004 :-

'Bravo' Toys	5,000 units at Rs. 100 each
'Champion' Toys	4,000 units at Rs. 200 each
'Super ' Toys	6,000 units at Rs. 180 each

The actual sales for August, 2004 were:

'Bravo' Toys	5,750 units at Rs. 120 each
'Champion ' Toys	4,850 units at Rs. 180 each
'Super ' Toys	5,000 units at Rs. 165 each

The cost per unit of Bravo , Champion and super Toys were Rs. 90, Rs. 170, Rs. 130 respectively .

Analyse the variance to show:

(a) the effect on turnover

- (1) Sales price variance
- (2) Sales mix variance
- (3) Sales quantity variance
- (4) Total sales value variance

(b) the effect on profit :

- (1) Sales margin : price variance
- (2) Sales margin : mix variance
- (3) Sales margin : quantity variance
- (4) Total sales margin variance.

[Ans.:

Sales price variance	Rs.57,000(A)	Sales mix variance	Rs.30,200(A)
Sales Quantity Variance	Rs.95,200(F)	Total sales value variance	Rs.8,000(F)
Sales margin price variance	Rs. 57,000(A)	Sales margin mix variance	Rs. 35,800(A)
Sales margin quantity variance	Rs. 18,800(F)	Total sales margin variance	Rs. 74,000 (A)]

$$\text{Market Size Variance} = (\text{Budgeted mkt. share \%}) \times (\text{Actual Industry sales volume in units} - \text{Budgeted industry sales volume in units}) \times (\text{Budgeted Avg. Contribution margin per unit})$$
$$\text{Market Share Variance} = (\text{Actual Mkt. Share \%} - \text{Budgeted Mkt. Share \%}) \times (\text{Actual industry sales volume}) \times (\text{Budgeted Average Contribution Margin per unit})$$

Question 17: per computers manufactures and sells three related PC models:

1. PC — Sold mostly to college students
2. Portable PC— Smaller version of PC positioned as home computer
3. Super PC — Sold mostly to business executives

Budgeted and actual data for 1995 is as follows:

	Budget for 1995			
	Selling Price per Unit	Variable Cost per Unit	Contribution margin per Unit	Sales Volume in Units
	Rs.	Rs.	Rs.	Rs.
PC	24,000	14,000	10,000	7,000
Portable PC	16,000	10,000	6,000	1,000
Super PC	1,00,000	60,000	40,000	2,000
				10,000

	Actual for 1995			
	Selling Price per Unit	Variable Cost per Unit	Contribution margin per Unit	Sales Volume in Units
	Rs.	Rs.	Rs.	Rs.
PC	22,000	10,000	12,000	8,250
Portable PC	13,000	8,000	5,000	1,650
Super PC	70,000	50,000	20,000	1,100
				11,000

Super computers derived its total unit sales budget for 1995 from the internal management estimate of a 20% market share and an industry sales forecast by computer manufacturers association of 50,000 units. At the end of the year the association reported actual industry sales of 68,750 units.

Required:

- (i) Compute the individual product and total sales volume variance.
- (ii) Compute total sales quantity variance.
- (iii) Compute the market size and market share variances.
- (iv) Compute individual product and total sales mix variances.
- (v) Comment on your results.

[Ans.: (i) PC: 12500000F; Portable PC: 3900000F; Super PC: 36000000A; (ii) 15600000F; (iii) 58500000F & 42900000A; (iv) PC: 3080000A; Portable PC: 5280000A; Super PC: 26840000A]

Reconciliation Statement:-

Reconciliation statement is prepared to reconcile the actual profit with the budgeted profit

Particulars	Favorable	Unfavorable	(Rs)
Budgeted Profit :			
Add Favorable variances & Deduct Unfavorable variances			
Sales Variances :			
Sales Margin price variance			
Sales Margin mix variance			
Sales Margin qty. variance			
Total:			
Cost variance :-			
Material :			
Price variance			
Yield variance			
Mix variance			
Labour :			
Rate variance			
Mix variance			
Yield variance			
Idle time variance			
Variable overhead variance :			

Expenditure variance			
Efficiency variance			
Fixed overhead variance :			
Expenditure variance			
Efficiency variance			
Capacity variance			
Calendar variance			
Total Cost Variances:			
Actual Profit :			

Question 18: A company, which uses standard marginal costing, furnishes the following details relating to a single product manufacturing and sold in a quarter:

	Budget	Actual
Sale units	6,000	6,400
	(Rs.'000)	(Rs.'000)
Sales	<u>1500</u>	<u>1696</u>
Direct materials	240	270
Direct labour	360	416
Variable overheads	<u>600</u>	<u>648</u>
Total variable costs	<u>1200</u>	<u>1,334</u>

The sales budget is based on the expectation of the company's estimate of market share of 12%. The market report reveals that the actual sales of the product in the whole country for the quarter is 60,000 units.

Further data are given as under:

	Standard	Actual
Direct material price per Kg.	Rs. 8	Rs. 7.50
Direct labour rate per hour	Rs. 6	Rs. 6.40

Required:

- Compute the following variances for the quarter :
 - Gross margin sales
 - Market size variance
 - Market share variance
 - Sales price variance
 - Direct materials usage and price variance
 - Direct labour efficiency and rate variances
 - Variable overheads efficiency and expense variances.
 - Prepare an operating statement reconciling the budgeted contribution with actual contribution with actual contribution. (12 Marks) May/03 & (9 Marks) June/09 [Old Course-Adapted]
- [Ans.:** (a) Market size variance Rs. 60,000F , (b) Market share variance Rs. 40,000A, (c) Gross margin sales volume variance Rs. 20,000F , (d) Gross margin sales price variance Rs. 96,000F, (e) Direct material usage variance Rs. 32000A, Direct Material Price variance Rs. 18,000 F , (f) Direct labour efficiency variance Rs. 6,000A , Direct labour rate variance Rs. 26,000A, (g) Variance overhead efficiency variance Rs. 10,000A, Variable overhead expense variance Rs. 2,000F ; (2) Total actual contribution Rs. 3,62,000.]

Question 19: A single product company has furnished the following standard cost data per unit of output:

Direct materials	20 kg @ Rs.10 per kg
Direct labour	12 hours at Rs. 5.50 per hour
Variable overheads	12 hours at Rs. 10 per hour
Fixed overheads	Rs.9,00,000 per month based on a normal volume of 60,000 direct labour hours
Selling price	Rs.600 per unit.

The cost incurred and other relevant information for the month of November 2004 are as under:

Direct Materials used	1,00,000 kg at a cost of Rs.10,50,000
Direct Wages paid	Rs.3,10,000 for 62,000 hours worked
Overheads	Rs.15,26,000 out of which a sum of Rs.9,40,000 is fixed.
Actual output	4,800 units sold for Rs.28,32,000

Assume no stocks of work-in-progress or finished goods at the beginning or the end of the month.

Required:

- Compute all variance
- Prepare an operating statement reconciling the budgeted profit and actual profit.

[Ans.: (i) DMCV: Rs. 90000A; DMPV: Rs. 50000A; DMUV: Rs. 40000A; DLCV: Rs. 6800F; DLRV: Rs. 31000F; DLEV: Rs. 24200A; VOCV: Rs. 10000A; FOCV: Rs. 76000; FO Exp V: Rs. 40000A; FOVV: Rs. 36000A; FO Cap V: Rs. Rs. 30000F; FO Eff. V: Rs. 66000A; SVV: Rs. 168000A; SPV: Rs. 48000A; S Vol. V: Rs. 120000A; S Margin Vol. V: Rs. 6800A (ii) Actual Profit: Rs. (54000); Std. profit per unit: Rs. 34]

Question 20: The budgeted output of a single product manufacturing company for the year ending 31st March was 5,000 units. The financial results in respect of the actual output of 4,800 units achieved during the year were as under:

	Rs.
Direct material	29,700
Direct wages	44,700
Variable overheads	72,750
Fixed overheads	39,000
Profit	36,600
Sales	2,22,750

The standard wage rate is Rs. 4.50 per hour and the standard variable overhead rate is Rs. 7.50 per hour.

The cost accounts recorded the following variances for the year:

Variances	Favourable	Adverse
	Rs.	Rs.
Material price	—	300
Material usage	—	600
Wage rate	750	—
Labour efficiency	—	2,250
Variable overhead expenses	3,000	—
Variable overhead efficiency	—	3,750
Fixed overhead expense	—	1,500
Selling price	6,750	—

Required:

- Prepare a statement showing the original budget.
- Prepare the standard product cost sheet per unit.
- Prepare a statement showing the reconciliation of originally budgeted profit and the actual profit.

[Ans.: Budgeted Profit: 37500; Selling price per unit: Rs. 45]

Miscellaneous Variances :

Non Conventional Variance Analysis:

Quality Cost Variance = It represents difference between (a) actual quality cost, and (b) budgeted quality cost.

Controllable & Uncontrollable Variances:

As per CIMA, Operating & Planning Variances are subsets of material total variance replacing traditional usage & price variances. These variances are used to isolate variances caused by (i) unforeseen circumstances, i.e. planning variance & (ii) operational variance, which reflects non-standard performance.

Planning variances seek to explain the extent to which the original standard needs to be adjusted in order to reflect changes in operating conditions between the current situation and that envisaged when the standard was originally calculated, in effect it means that the original standard is brought up to date so that it is a realistic attainable target in current conditions. It can be controllable as well as uncontrollable.

Operating variances indicate the extent to which attainable targets (i.e. the adjusted standards) have been achieved. Operating variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance. Operating Variance is always controllable.

Price Planning Variance = (Std. Rate-Revised Std. Rate)× Standard Quantity on revised standard

Usage Planning Variance = (Std. Qty.- Revised Std. usage)×Std. Price

Price Operating Variance = (Prevailing Rate/Revised Std. Rate-Actual Rate)× Actual Quantity

Usage Operating Variance = (Std. usage based on revised std.-Actual Qty.)×Revised Std. Price

Case Study

XYZ Ltd. manufactures a standard animal feed.

The predetermined standards for the budget period Jan-March 2005 were set by management in October 2004.

Standard hours per tonne of product is 1.1

Standard direct labour rate per hour is Rs.8.50

Standard usage of material per tonne of product is 1.2 tonnes

Standard price of material is Rs.70 per tonne

Research shows that in the quarter ended 31 March 2005 the prevailing market price of material had been Rs.71 per tonne. Since the budget was set the wage rate had increased to Rs.8.75 per hour, national pay award.

During the quarter modifications to plant and machinery shows that direct labour hours per unit should be 1.05 per tonne of product and that standard usage would reduce to 1.175 tonnes per tonne of product.

During the quarter ended 31 March 2005 activity and costs showed:

Actual production 15,400 tonnes

Raw material usage 16,555 tonnes

Actual cost of raw materials used Rs.1,191,960

Actual direct labour cost 16,632 hours Rs.143,035

Variance Analysis Report

Traditional Approach

Direct Labour

Direct Labour Cost Variance = Standard Cost for Actual Production – Actual Cost
= ((15400×1.1) hrs×Rs.8.5) – Rs.143035 = Rs. 955(F)

Direct Labour Rate Variance = (Standard Rate-Actual Rate)× Actual Hours
= (Rs. 8.50-Rs.8.5999)×16632 = Rs. 1663 (A)

Direct Labour Efficiency Variance = (Std. Hours for actual Output-Actual Hours)×Std. Rate
= (16940-16632)×Rs. 8.50 = Rs. 2618 (F)

Direct Material

Direct Material Cost Variance = Standard Cost for Actual Production – Actual Cost
= ((15400×1.2) tonnes×Rs.70) – Rs.1191960 = Rs. 101640(F)

Direct Material Rate Variance = (Standard Rate-Actual Rate)× Actual Quantity
= (Rs. 70-Rs.72)×16555 = Rs. 33110 (A)

Direct Material Quantity Variance = (Std. Qty. for actual Output-Actual Qty.)×Std. Rate
= (18480-16555)×Rs. 70 = Rs. 134750 (F)

Operating & Planning Variances

Direct Material Price Operating Variance = (Prevailing Rate-Actual Rate)× Actual Quantity
= (Rs. 71-Rs.72)×16555 = Rs. 16555 (A)

Direct Material Price Planning Variance = (Std. Rate-Revised Std. Rate)× Standard Quantity on revised standard
= (Rs. 70-Rs.71)×(15400×1.175) = Rs. 18095 (A)

Direct Material Usage Operating Variance = (Std. usage based on revised std.-Actual Qty.)×Revised Std. Price
= (18095-16555)×Rs. 71 = Rs. 109340 (F)

Direct Material Usage Planning Variance = (Std. Qty.- Revised Std. usage)×Std. Price
= (18480-18095)×Rs. 70 = Rs. 26950 (F)

Summary

Planning Variances Rs.

Rs.

Price 18,095 A

Usage 26,950 F

8,855 F

Operating Variances

Price 16,555 A

Usage	109,340 F
92,785 F	
Traditional Variance	101,640 F

Direct Labour

Direct Labour Rate Operating Variance = (Revised Rate-Actual Rate)× Actual Hours

$$= (\text{Rs. } 8.75 - \text{Rs. } 8.5999) \times 16632 = \text{Rs. } 2495 \text{ (F)}$$

Direct Labour Rate Planning Variance = (Std. Rate-Revised Std. Rate)× Standard hours based on revised standard

$$= (\text{Rs. } 8.50 - \text{Rs. } 8.75) \times (15400 \times 1.05) = \text{Rs. } 4042.50 \text{ (A)}$$

Direct Labour Efficiency Operating Variance = (Std. hours based on revised std.-Actual Hrs.)×Revised Std. wage rate

$$= (16170 - 16632) \times \text{Rs. } 8.75 = \text{Rs. } 4042.50 \text{ (A)}$$

Direct Labour Efficiency Planning Variance = (Std. Hrs.-Revised Std. hrs.)×Std. Rate

$$= (16940 - 16170) \times \text{Rs. } 8.50 = \text{Rs. } 6545 \text{ (F)}$$

Summary

Planning Variances Rs.

Rs.

Rate 4,042.50 A

Efficiency 6,545 F

2,502.50 F

Operating Variances

Rate 2,495 F

Efficiency 4,042.50 A

1,547.5 A

Traditional Variance 955 F

Note: In foregoing case material planning variance is controllable though labour planning variance is uncontrollable.

Question 21: C Preserves produces Jams, Marmalade and Preserves. All the products are produced in a similar fashion; the fruits are cooked at low temperature in a vacuum process and then blended with glucose syrup with added citric acid and pectin to help setting

Margins are tight and the firm operates, a system of standard costing for each batch of Jam.

The standard cost data for a batch of raspberry jam are

Fruits extract	400 kgs @ Rs. 16 per kg.
Glucose syrup	700 kgs @ Rs. 10 per kg.
Pectin	99 kgs. @ 33.2 per kg.
Citric acid	1 kg at Rs. 200 per kg.
Labour	18 hours @ Rs. 32.50 per hour.

Standard processing loss 3%.

The climate conditions proved disastrous for the raspberry crop. As a consequence, normal prices in the trade were Rs. 19 per kg for fruits abstract although good buying could achieve some savings. The impact of exchange rates for imported sugar plus the minimum price fixed for sugarcane, caused the price of syrup to increase by 20%.

Fruit extract	428 Kgs at Rs. 18 Per Kg .
Glucose syrup	742 Kgs at Rs. 12 per Kg .
Pectin	125 Kgs at Rs. 32.8 per Kg .
Citric aid	1 Kgs at Rs. 95 per Kg .
Labour	20 hrs .at Rs.30 per hour .

Actual output was 1,164 kgs of raspberry jam.

You are required to:

- Calculate the ingredients planning variances that are deemed uncontrollable.
- Calculate the ingredients operating variances that are deemed controllable.
- Calculate the mixture and yield variances.
- Calculate the total variances for the batch.

(11 Marks) May/05

[Ans.: (1) Total Rs. 2,600(Adverse), (2) Total Rs. 1,316.2(adverse) Price variance 583(F), Usage variance 583 (f) Usage variance 1,899.2 (A) (3) Total 340.3 (A) Yield variance 155.9 (A), Labour operating variance 15 (A) , (5) Total variance 3931.2 (A)]

Possible Causes of Cost Variances :

Variance	Favourable	Adverse
a) Material Price	- Unforeseen discounts received - Greater care taken in purchasing - Change in material standard	- Price Increase - Careless Purchasing - Change in material Standard
b)Material Usage	- Material used of higher quality than standard - More effective use of material - Errors in allocating material to jobs	- Defective material - Excessive Waste - Theft - Stricter quality control - Errors in allocating material to jobs
c) Labour Rate Pay	Use of apprentices or other workers at a rate of pay lower than standard	Wage Rate Increase
d) Idle Time		- Machine Breakdown - Non-Availability of Labours - Illness or injury to workers
e)Labour Efficiency	Output produced more quickly than expected, i.e., actual output in excess of standard output set for same no. of hrs. because of work motivation, better quality of Labour or equipments	- Lost time in excess of standard allowed - Output lower than standard set because of deliberate restriction, lack of training, or sub standard Labour used. - Errors in allocating time to jobs.
f) Overhead Expenditure	- Savings in costs incurred - More economical use of services	Increase in cost of services used. Excessive use of change in type of services used.
g) Overhead efficiency	The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard.	The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard.
h) Overhead Volume	Excess of Actual time worked over budget.	- Excessive Idle time - Shortage of Plant Capacity

A/cing procedure for standard cost:

Single Plan: It contemplates analysis of variance at source i.e. the analysis of variance is done from the original documents like invoices, labour sheets, etc. Unlike partial plan, price variance can be analyzed at the time of receipt of material (in case of material) & usage variance can be analyzed & recorded as & when finished output is recorded i.e. when excess materials are used. The features of single plan can be summarized as:

- Work-in-progress A/c is debited & credited with standard cost.
- Inventory is valued at standard cost
- All Variances are computed at any stage before debiting WIP A/c. Rate & Expenditure variances are computed at the inception. Quantity/efficiency variances are calculated at the time of crediting control A/cs.

1

Material Control A/c Dr.	Actual Qty @ Std. Rate	
Material Price Variance A/c Dr.	Unfavourable Variance	
To Material Price Variance A/c		Favourable Variance
To A/cs Payable		Actual Qty @ Actual Rate

(To record purchase of raw materials at standard price and related unfavourable/favourable variance)

2	Work-in-Progress Control A/c Dr.	Std. Qty @ Std. Rate	
	Material Usage Variance A/c Dr.	Unfavourable Variance	
	To Material Usage Variance A/c		Favourable Variance
	To Material Control A/c		Actual Qty @ Std. Rate
(To transfer raw materials to production at standard usage rates and related unfavourable/favourable quantity variance)			

3 Same Entry for Labour as in entry 1

4 Same Entry for Labour as in entry 2

5	Overhead Expense Control A/c Dr.	Actual Overhead	
	To Cash		Actual Overhead
(To record expenses on overhead)			

6	Work-in-Progress A/c Dr.	Absorbed Overhead	
	Overhead Expense Variance A/c	Adverse/Underapplied	
	Overhead Efficiency Variance A/c	Adverse/Underapplied	
	To Overhead Expense Variance A/c		Favourable/Overapplied
	To Overhead Efficiency Variance A/c		Favourable/Overapplied
	To Overhead Expense Control A/c		Actual Qty @ Actual Rate
(To increase work in process for the standard variable overhead, and record the related efficiency and spending variance)			

1. Overhead Volume Variance will be calculated in spite of Overhead Efficiency Variance in case of Fixed

Note: Overhead.

Partial Plan: In this system variances are analyzed at the end of period. Overhead A/c will be opened & closed on normal basis. If nothing is specified in question, Partial Plan will be followed. Some salient features of partial plan are:

- Work-in-progress A/c is debited with actual cost of Labour, actual cost of labour & actual overhead.
- Work-in-progress A/c will be credited with standard cost of production.
- At the end of A/cing period work-in-progress A/c is credited with standard cost of unfinished goods.
- After entering at iii) above is passed, debit & credit sides of work-in-progress account are compared & difference is transferred to cost variance, which is further analyzed for reporting to management on the basis of additional information not recorded in accounts.

1	Material Control A/c Dr.	Actual Qty @ Actual Rate	
	To General Ledger Adjustment A/c		Actual Qty @ Actual Rate
(To record purchase of raw materials at actual price)			
2	Work-in-Progress Control A/c Dr.	Actual Qty @ Actual Rate	
	To Material Control A/c		Actual Qty @ Actual Rate

	(To transfer raw materials to production)		
3	Same Entry for Labour as in entry 1		
4	Same Entry for Labour as in entry 2		
5	Work-in-Progress Control A/c Dr. To Overhead Expense Control A/c (To record expenses on overhead incurred)	Actual Overhead	Actual Overhead
6	Finished Goods A/c Dr. To Work-in-Progress A/c (Being the standard cost of production transferred to finished good)	Standard Cost	Standard Cost
7	Cost of Sales A/c Dr. To Finished Goods A/c (Being the standard cost of goods sold transferred to Cost of Sales A/c)	Standard Cost	Standard Cost
8	Work-in-Progress A/c Dr. To All favourable variances (Being variances carried to respective A/cs pending investigation before being finally disposed off)		Favourable/Overapplied
8	All unfavourable variances Dr. To Work-in-Progress A/c (Being variances carried to respective A/cs pending investigation before being finally disposed off)	Unfavourable/Underapplied	

In case Non-Integrated System is adopted, expenses will be transferred to Cost Ledger Control A/c (also known as Dustbin A/c, Nominal Ledger Control A/c, General Ledger Control A/c) in spite of A/cs Payable, Wages Payable, Cash A/c, etc. Also balance of P&L A/c is transferred to Cost Ledger Control A/c. In case of Partial Plan it generally taken as Non-Integrated System

Disposition of Variances:

There is no unanimity of opinion in regard to disposition of variances. The following are various methods:

- 1) Write off all variances to P&L A/c or cost of sales every month.
- 2) Distribute the variance prorata of cost of sales, work-in-progress and finished good stocks.
- 3) Write off quantity variance to P&L A/c but the price variance may be spread over cost of sales, work-in-progress & finished goods stock. The reason behind apportioning price variances to inventories & cost of sales is that they represent cost although they are described as variance.

Question 22: Under the single plan, record the journal entries giving appropriate narration, with indication of amounts of debits or credits alongside the entries, for the following transactions using the respective control A/c.

- (i) Material price variance (on purchase of materials)
- (ii) Material usage variance (on consumption)
- (iii) Labour rate variance.

(6 Marks) Nov./06

Question 23: Material purchased 10,000 pieces at Rs. 1.10 Rs. 11,000
 Materials consumed 9,500 pieces at Rs. 1.10 Rs. 10,450
 Actual wages paid 2,475 hours at Rs. 3.50 Rs. 8,662.50
 Actual factory expenses incurred Rs. 17,000 (Budgeted Rs. 16,500) Units
 produced: 900 units and sold at Rs. 60 per unit.
 The standard rates and prices are as under:
 Direct materials Re. 1.00 per unit Standard input
 10 pieces per unit Direct labour rate Rs. 3.00 per
 hour
 Standard requirement 2.5 hours per unit
 Overheads Rs. 6.00 per labour hour
 Explain the operation of the recording of standard cost under this method.

Question 24: Standard cost sheet per unit output is as under Rs.
 Direct material 3 pcs. @ Rs. 2.15 6.45
 Direct Labour:
 Dept. A 2 hrs @ Rs. 1.75 3.50
 Dept. B 4 hrs. @ Rs. 1.50 6.00 9.50
 Overheads :
 Dept. A 2 hrs. @ Re. 0.50 1.00
 Dept. B 4 hrs. @ Re. 1.00 4.00 5.00
 20.95

Transactions for the period are as under :

Materials purchased and consumed:

8,600 pcs. @ Rs. 2.50 each

Labour time spent

Dept. A. 5,200 hours

Dept. B. 12,000 hours

There is no change in labour rates.

Actual factory overheads are :

Dept. A. Rs. 3,000

Dept B. Rs. 12,500

Units produced:

Dept. A. 2,800

Dept. B. 2,800

Budgeted overheads:

Dept. A. Rs. 3,000

Dept. B. Rs. 12,000

Record the transactions under single plan.

Question 25: Rainbow Ltd. manufactures paint in batches. The company uses standard costing system and the variances are reported weekly. You have taken the account sheet for study for variance analysis discussion. While working coffee was spilled on these sheets and only following could have been retrieved:

Dr.

Cr.

	Raw Material -1		
Beg. Balance	0		
		Closing Balance	18,000
	Raw Material -2		6,000
Beg. Balance	18,000		
		Closing Balance	41,400
	Work in Progress		
Beg. Balance	0		

Raw Material -2	72,000		
		Closing Balance	0
		Sundry Creditors	1,27,200
		Wages outstanding	
		51,750	
		Quantity Variance-Material-1	
		1,200	
		Price Variance-Material-2	6,600
		Efficiency Variance-Labour	7,200

Other information's are: standard cost of Material – 2 is Rs180 per litre and standard quantity is 5 litres. Standard wages rate is Rs24 per hour and a total 2,300 hours were worked during the week. 1,000 kg of Material -1 and 550 litres of Material-2 were purchased. Sundry creditors are for material acquisition, and wages outstanding pertain to direct labour.

You are required to compute Material-1 Rate Variance, Material-2 Quantity Variance & Labour Spending Variance, Standard hours allowed for production and purchase value of Material-1 for variance analysis discussion.

[Ans.: Material – 1 rate variance	= Rs. 2,400(F)	
Material - 2 quantity variance	= Rs. 3,600(A)	
Labour spending variance	= Rs. 3,450(A)	
Standard hour allowed	= 2000 hour	
Cost of material allowed	= Rs. 21,600]	(11Marks)Nov/05

Ratio Analysis:

- 1) Efficiency Ratio = $\frac{\text{Output expressed in terms of std. hours} \times 100}{\text{Actual Hours spent for producing the output}}$
- 2) Activity Ratio = $\frac{\text{Actual Output in Std. hours} \times 100}{\text{Budgeted output in std. hours}}$
- 3) Calendar Ratio = $\frac{\text{Actual No. of working days in a period} \times 100}{\text{No. of working days in related budgeted period}}$
- 4) Actual Capacity Usage Ratio = $\frac{\text{Actual Hours worked} \times 100}{\text{Max. Possible no. of working hours}}$
- 5) Actual usage of budgeted capacity ratio = $\frac{\text{Actual Working Hours} \times 100}{\text{Budgeted Hours}}$
- 6) Standard Capacity Usage Ratio = $\frac{\text{Budgeted Hours} \times 100}{\text{Max. Possible no. of working hours}}$

Question 26: What are the various formulae used in calculating budget ratios. (4 Marks) June/09-NC

Question 27: A company manufactures two products X and Y. Product X requires 8 hours to produce while Y requires 12 hours. In April, 2004, of 22 effective working days of 8 hours a day, 1,200 units of X and 800 units of Y were produced. The company employs 100 workers in production department to produce X and Y. The budgeted hours are 1,86,000 for the year.

Calculate Capacity, Activity and Efficiency ratio and establish their relationship. (6 Marks) Nov./04

[Ans.: Capacity ratio = 113.55%, Activity ratio = 123.87%, Efficiency ratio = 109.09%]

Question 28: A company manufactures two products X & Y. Product X requires 5 hours to produce while Y requires 10 hours. In July 2004, of 25 effective working days of 8 hours a day, 1000 units of X and 600 units of Y were produced. The company employs 50 workers in the production department to produce X and Y. The budget hours are 102000 for the year.

Calculate capacity ratio, activity ratio and efficiency ratios. Also establish their interrelationship (Nov/96)

[Ans.: 117.65%, 129.41%, 110%]

Question 29: following is the standard cost card of a component:

Material	2 units at Rs 15	Rs 30
Labour	3 hours at Rs 20	Rs 60
Total overheads	3 hours at Rs 10	Rs 30

During a particular month 10000 units of the component were produce and the same was found to be at 60% capacity of the budget. In preparing the variance report for the month, the cost accountant gathered the following information:

Labour	Rs.6,50,000
Variable Overheads	Rs.2,00,000
Fixed Overheads	Rs.3,00,000
Material price variance	Rs.70,000 (A)
Material cost variance	Rs.50,000 (A)
Labour rate variance	Rs.50,000 (F)
Fixed overhead expenditure variance	Rs.50,000 (A)

You are required to prepare from the above details.

- (1) Actual material incurred
- (2) Standard cost of materials actually consumed
- (3) Labour efficiency variance
- (4) Variable OH efficiency variance
- (5) Variable OH expenditure variance
- (6) Fixed OH efficiency variance
- (7) Fixed OH capacity variance.
- (8) Fixed OH volume variance.

(14 Marks) Nov./05

[Ans.: (1) 350000 (2) 280000 (3) 100000A (4) 25000A (5) 25000A (6) 25000A (7) 75000A (8) 100000A]

Question 30: The following is the Operating Statement of a company for April, 2001.

Budgeted profit	Rs. 1,00,000
-----------------	-----------------

Variances:	Favourable Rs.	Adverse Rs.	
Sales Volume		4,000	
Price	9,600		
Direct Materials - Price		4,960	
- usage		6,400	
Direct Labour - Rate		3,600	
- Efficiency	3,600		
Fixed Overhead -Efficiency	2,400		
Capacity		4,000	
Expense	1,400		
	<u>17,000</u>	<u>22,960</u>	5,960A
Actual profit			<u>94,040</u>

Additional information is as under :

Budget for the year 120,000 unit

Budgeted fixed overhead Rs 4,80,000 per year
 Standard cost of one unit of product is :
 Direct materials 5kg @ Rs. 4 per kg .
 Direct load 2hour @ Rs. 3 per hour
 Fixed overheads are absorbed on direct labour
 Profit 25% on sales.

You are required to prepare the annual financial the profit/loss statement for April ,2001 in the following format

Account	Qty./hour	Rate/price	Actual value
Sale			
Direct materials			
Direct labour			
Fixed overheads			
Total cost			
Profit			

(13 Marks) May/01

[Ans : Profit 94040]

Question 31: F Manufacturing Ltd., uses the three variances method to analyses the manufacturing overhead variances. Manufacturing overhead variances for the fiscal year just ended were computed as follows:

Spending	Rs.86,000	Adverse
Efficiency	Rs.36,000	Favorable
Volume	Rs.80,000	Favorable

The manufacturing overhead application rate for the year was Rs.160 per machine hours of which Rs.60 per machine hour was the variable component. The year end balance in the Manufacturing Overhead Control Account was Rs.16,50,000 and the standard machine hours for the year were 11,300.

From the above data compute:

- Budgeted Machine Hours.
- Actual Machine Hours.
- Applied Manufacturing Overhead.
- Total Amount of Fixed Overhead Cost (budgeted).

(13 Marks) Nov./00

[Ans.: (i) 10500hrs (ii) 10700hrs (iii) 1680000 (iv) 922000]

Question 32[Standard Costing with equivalent production units]: A single product company has prepared the following cost sheet based on 8,000 unit of output per month:

Direct materials 1.5 kg @ Rs 24 per kg	36.00
Direct labour 3 hour @ Rs 4 per hour	12.00
Factory overhead	12.00
Total	60.00

The flexible budget for factory overhead is as under:

Output (unit)	6,000	7,500	9,000	10,500
Factory overhead (Rs.)	81,600	92,400	1,03,200	1,14,000

The actual results for the month of October 2002 are given below:

- Direct material purchase and consumed were 11,224 Kg at Rs 2,66,570.
- Direct labour hour worked were 22,400 and direct wages paid amounted to Rs 96,320.
- Factory overhead incurred amounted to Rs. 96,440 out of which the variable overhead is Rs. 2.60 per direct labour hour worked.
- Actual output is 7,620 unit.
- Work-in-process:

Opening WIP: 300 unit:
 Material 100% complete
 Labour and overhead 60% complete
 Closing WIP: 200 unit:
 Material 50% complete
 Labour and overhead 40% complete

You are required to analyze the variance.

(12 Marks) Nov/02

[Ans.: Material price variance Rs. 2806F; Material cost variance Rs 550F; Material usage variance Rs. 2256A; Labour cost variance Rs. 6080A; Labour efficiency variable Rs. 640F; Variable overhead expenditure variance Rs. 4480A; Variable overhead efficiency variance Rs. 384F; Total variance overhead cost variance Rs. 4096A; Expenditure variance Rs. 200F; Efficiency variable Rs. 256F; capacity variable Rs. 2560A; Volume variance Rs. 2304A; Total fixed overhead cost variance Rs. 2104A]

Question 33: The standard product-cost sheet of MSC Ltd., which plans to produce 8000 units of a product, is as under:

Direct materials (1.50 kg. @Rs. 6)	(Rs.) 9
Direct labour (4 hrs. @ Rs. 6)	24
Variable overheads	4
Fixed overheads	12
Selling price	53

The actual results of a period are as under:

Actual orders received	8200 units
Actual sales	7500 units
Actual production	7500 units
Direct materials purchased & issued to production	12000 kg
Direct materials price/kg	Rs. 6.50
Direct labour hours worked	29000
Direct labour hour rate	Rs. 6.25

Total overheads incurred Rs. 130000
 Out of which variable overheads were Rs. 36000
 Closing work-in-progress 300 units-Materials 100% complete & Labour & overheads 60% complete.
 Opening work-in-progress 600 units-Materials 100% complete & Labour & overheads 75% complete.
 The budgeted market share was 16% and the actual sales in the country for the period of this product is 60000 units.

Actual selling price Rs. 54 per unit.

Analyse the variances in as much details as possible.

[Ans.: Market size variance: Rs. 6400F; Market share variance: Rs. 5600A; Sales volume variance: Rs. 2800A; Sales price variance: Rs. 7500F; Material usage variance: Rs. 7200A; Material price variance: Rs. 6000A; Labour efficiency variance: Rs. 480A; Labour rate variance: Rs. 7250A; Variable overhead efficiency variance: Rs. 80A; Variable overhead expenditure variance: Rs. 7000A; Fixed overhead efficiency variance: Rs. 240A; Fixed overhead volume variance: Rs. 9240A; Fixed overhead capacity variance: Rs. 9000A; Fixed overhead expenditure variance: Rs. 2000F]

Question 34: A Processing company uses Standard Process Costing method. The Standard Process Cost Card is as follows:

	Rs. Per kg. of Finished product
Direct material - 2 kgs @ Rs.10 per kg	20
Direct labour - 3 hours @ Rs.20 per hour	60
Fixed overheads (Recovered on labour-hours)	90
Total	<u>170</u>

Budgeted output for the period is 1,000 kgs.

Actual production and cost data for the period are as follows:

Actual production	950 kgs	
Direct material	2,900 kgs	at Rs.32,000
Direct labour	3,300 hours	at Rs.68,000
Fixed overheads		Rs.88,000

Stocks:

Opening WIP 250 kgs.	Degree of completion	- Material -100%	Labour and overheads - 60%
Closing WIP 450 kgs	Degree of completion	- Material -100%	Labour and overheads - 20%
Finished stock – 1200 kgs			

The company uses FIFO Method for evaluation of stocks.

Required:

Computation of cost variance in as much detail as possible and Process Cost Reconciliation Statement.

[Ans.: MPV Rs. 3000A; MUV Rs. 1000A; LRV Rs. 2000A; LEV Rs. 2400F; FOBV Rs. 2000F; FO Cap V Rs. 9000F; FOEV Rs. 3600F]

[Hint: While calculating equivalent production, we are supposed to take 950 kgs. as units completed & 1200 kgs. as units completed & transferred.]

Question 35: The following figures are available. Find out the missing figures, giving appropriate

Budgeted profit		Rs. 15,000
Less: Adverse variances:		
Contribution price variance	10,600	
Direct materials variance	1,000	
Fixed overhead variance	<u>600</u>	<u>(12,200)</u>
2,800		
Add: Favourable variances		
Contribution quantity variance	1,800	
Direct wages variance	600	
Variable overhead variance	<u>1,800</u>	<u>4,200</u>
Actual profit		<u>7,000</u>
There is no inventory		
Production units = Sales units for both actual and budget		
Other Information		
Standard selling price	Rs. 18/unit	
Standard variable cost	Rs. 15/unit	
Standard contribution	Rs. 3/unit	

Actual selling price Rs. 17/unit
 Budgeted sales 10,000 units
 Standard material cost p.u. = Re. 1 (which is 5 kg. @ Rs. 20 Paise/kg.).
 Material usage variance = 400 (Adv.)
 Actual labour hours @ actual rate = Rs. 63,000
 Actual labour hours @ standard rate = Rs. 61,950
 Variable overhead standard rate = Rs. 2
 Standard hours of production = 4 per unit
 Variable overhead at standard rate = Rs. 84,800.
 Variable overhead expenditure variance = 400 (A).
 Budgeted fixed overhead = Rs. 15,000.

Find out the following:

- (i) Actual sales units
- (ii) Actual sales rupees
- (iii) Actual quantity of raw materials used
- (iv) Labour efficiency variance
- (v) Actual variable overhead in rupees
- (vi) Variable overhead efficiency variance
- (vii) Actual Fixed Overhead
- (viii) Operating profit variance

(8 Marks) Nov/06

[Ans.: (i) 10,600 units (ii) 1,80,200 (iii) 55,000 Kgs (iv) 1650 (f) (v) Rs. 83,000 (vi) 2,200 (F) (vii) Rs. 15,600 (viii) for budget profit Rs. 8,000(A) For standard profit Rs. 9,800(A)]

Question 36: A company produces a product X, using raw materials A and B. The standard mix of A and B is 1:1 and the standard loss is 10% of input.

You are required to compute the missing information indicated by “?” based on the data given below:

	A	B	Total
Standard price of raw material (Rs./kg.)	24	30	
Actual input (kg.)	?	70	
Actual output (kg.)			?
Actual price Rs./kg.	30	?	
Standard input quantity (kg.)	?	?	
Yield variance (sub usage)	?	?	270(A)
Mix variance	?	?	?
Usage variance	?	?	?
Price variance	?	?	?
Cost variance	0	?	1300(A)

[Ans.: (14Marks)May/07

	Yld variance	Mix variance	Usage variance	Price variance	Cost variance
A	1200 – 1320 = 120(A)	1320 – 960 = 360(F)	1200 – 960 = 240(F)	960 – 1200 = 240(A)	1200 – 1200 = 0
B	1500 – 1650 = 150(A)	1650 – 2100 = 450(A)	1500 – 2100 = 600(A)	2100 – 2800 = 700(A)	1500 – 2800 = 1300(A)
	<u>270A)</u>	<u>90A)</u>	<u>360A)</u>	<u>940A)</u>	<u>1300A)</u>

Question 37: A single product company operates a system of standard costing. The following data relate to actual output, sales, costs and variances for a month :

Actual output	18,000 units
	Rs.
Actual sales and costs incurred :	
Sales	12,15,000
Direct materials purchased and used 63,000 kg	2,04,760
Direct wages	2,12,040
Variable overheads	2,77,020
Fixed overheads	3,25,000

Total costs	10,18,810
Profit	<u>1,96,190</u>

Standard wage rate is Rs. 6 per hour. Budgeted output for the month is 20,000 units.
Variances are :

Direct materials	— Price variance	15,750A
	— Usage variance	27,000A
Direct labour	— Rate variance	6,840A
	— Efficiency variance	10,800F
Variable overheads	— Efficiency variance	14,400F
	— Expense variance	3,420A
Fixed overheads	— Expense variance	25,000A
	— Sales price variance	45,000F

Required :

- Present the original budget along with cost sheet showing the standard cost and profit per unit.
 - Calculate the sales gross margin volume and fixed overheads volume variances.
 - Prepare an operating statement reconciling the budgeted profit with actual profit. (12 Marks) May/04
- [Ans.: (1) Standard gross margin Rs. 2,60,000 ; (2) Sales gross margin volume variance Rs. 26,000 (A) fixed overhead volume variance Rs. 30,000(A) ; (3) Budgeted profit Rs. 2,60,000]

Question 38: Gems and co. manufacturing a product for which the standard selling price has been ascertained as below :

Materials – 2 units at Rs. 20	40
Labour – 20 hrs. @ Rs. 2.00	40
Variable overhead	8
Fixed overhead	<u>20</u>
Total cost	108
Profit	<u>32</u>
Selling	140

During the budget period , the company could produce and sell only 8,000 units as against budget of 10,000 units . The company's profit and loss account is presented below :

Profit and loss account for the year ended

Particular	Rs.	Particular	Rs
To materials (16,500 units)	3,96,000	By sales (8,000 units)	11,20,000
To wages (1,70,000 hours)	3,46,800		
To variable overhead	60,000		
To fixed overhead	1,84,000		
To net profit	<u>1,33,200</u>		
	11,20,000		11,20,000

4,000 hours were lost due to power failure. There was no opening or closing work-in-progress. You are to Reconcile the actual profit with the standard profit , in term of variance.

[Ans.: Budget profit	(10,000 @ Rs. 32)	3,20,000
Actual profit		1,33,200]

Question 39: Ravi, Richard, Rahim and Roop singh are regional salesman distributing the product of super perfumes ltd. the selling price of product is Rs. 400 per units . The sales quota and the standard selling expense for the year are :-

Salesman	sales quota	standard selling expense
Ravi	7,50,000	2,25,000
Richard	9,00,000	2,47,500
Rahim	11,50,000	2,87,500
Roop singh	6,00,000	2,25,000

Actual data for the year were as follow :-

Particular	Ravi	Richard	Rahim	Roop singh
Day on field work	200	175	225	250

Kilometers covered	20,000	18,000	18,000	30,000
	Rs.	Rs.	Rs.	Rs.
Sales	8,00,000	10,00,000	10,50,000	5,20,000
Salary	80,000	80,000	80,000	80,000
Free sample	9,000	7,500	5,375	8,000
Postage and stationery	8,000	9,000	10,000	6,000
Other expenses	9,000	5,000	4,000	10,000

The salesmen are allowed conveyance of Rs. 1.50 per kilometer and a daily allowance of Rs, 80 per day for the day spent on field work . Ravi get a commission of 6 % on sales and others are given a commission are 5% on sales . corporate sales office expense are chargeable at the rate of Rs. 30 per units sold in the case of Ravi and Richard and Rs. 40 per units in the case of Rahim and Roop singh . Prepare a schedule showing the selling cost variance by salesmen .

[Ans.:

Particular	Ravi	Richard	Rahim	Roop singh
Selling cost variance	(20,000) adverse	7,500 favourable	(39,375) adverse	(52,000) adverse

The total selling cost variance (adverse)=Rs. 1,03,875]

Question 40: Mr. M provides the following information relating to 1,000 units of product 'ZED'during the month of April 2004 :

Standard price per Kg. of raw material	- Rs. 3
Actual total direct material cost	-Rs. 10,000
Standard direct labour hours	-Rs. 1,600
Actual direct labour hours	-Rs. 1,800
Total standard direct labour cost	-Rs. 8,000
Standard variable overhead per direct labour hour	- Rs. 1
Standard variable cost per unit of ZED	- Rs. 1.60
Total standard variable overheads	- Rs. 1,600
Actual total variable overheads	- Rs. 1,620

The material usage variable is Rs. 600 adverse and the overall cost variable per unit of ZED is Rs. 0.07 adverse as compared to the total standard cost per unit of ZED of Rs. 21

You are required to compute the following :

1. standard quantity of raw material per unit of ZED .
 2. standard direct labour rate per hour
 3. standard direct material cost per unit of ZED.
 4. standard direct labour cost per unit of ZED .
 5. standard total material cost for the output .
 6. actual total direct labour cost for the output .
 7. material price variance .
 8. labour rate variance .
 9. labour efficiency variance .
 10. variable overhead expenditure variance .
 11. variable overhead efficiency variance .
- NOTE : key calculation should form part of the answer .

[Ans.:

Standard quantity of raw material per unit of ZED	3.8 Kgs.	Standard direct labour rate per hour	Rs. 5
Standard direct material cost per unit of ZED	Rs. 11.40	Standard direct labour cost per units of ZED	Rs. 8
Standard total material cost for the output	11,400	Actual total direct labour cost for the output	9,450
Material price variance	Rs. 2,000(F)	Labour rate variance	Rs. 450 (A)
Labour efficiency variance	Rs. 1,000(A)	Variable overhead expenditure variance	Rs. 180(F)
variable overhead efficiency variance	Rs. 200(A)		

Question 41: Z Ltd. uses standard costing system in manufacturing of its single product 'M'. The standard cost per unit of M is as follow :

Direct material	- 2 meters @ Rs. 6 per meters	12.00
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Direct labour	- 1hour @ Rs. 4.40 per hours	4.40
Variable overhead	- 1hour @ Rs. 3 per hour	<u>3.00</u>
		19.40

During July, 2004, 6000 units of M were product and the related data are as under :

Direct material acquired	- 19000 meters @ 5.70 per meters .
Material consumed	- 12670 meters .
Direct labour - hour @ Rs.! Per hour	Rs. 27,950
Variable overhead incurred	Rs. 20,475

The variable overhead efficiency variable is Rs . 1,500 adverse . variable overhead are based on direct labour hour . There are no stock of raw material in the beginning .

You are required to compute the missing figure and out all the relevant variances.

Compute of standard cost and actual costs

[Ans.:

Material cost variance	Rs. 219(A)	Material price variance	Rs.3,801(A)
Material usage variance	Rs.4,020(A)	Labour cost variance	Rs.1,550(A)
Labour rate variance	Rs.650 (F)	Labour efficiency variance	Rs.2,200(A)
Variable overhead variance	Rs.2,475(A)	Variable overhead efficiency variance	Rs.1,500(A)
Variable overhead budget variance	Rs.975(A)]		

Question 42: Goodwill Ltd. manufactures readymade shirts of a specific quality in lots to each special order from its overseas customers.

The standard cost for one dozen of shirt are:

Direct material	(24 metres @ Rs.11)	264
Direct labour	(3hour @Rs. 49)	147
Overheads	(3hour @Rs.40)	<u>120</u>
Standard cost per dozen		531

During July, 2004 it worked on three orders, for which the month's job cost record as following:

Lots no	Units	Materials used	Hours worked
45(UK)	1,700Doz	40,440 metres	5,130
46(US)	1,200Doz	28,825 metres	2,890
47(CAN)	1,000Doz	24,100 metres	2,980

Additional information:

(a) The company bought 95,000 metres of material during July at a cost of Rs. 10,64,000. The material price variance is recorded when material are purchased .All inventories carries as cost.

(b) Direct labour during July the amounted to Rs. 5,50,000. The employees were paid at Rs. 50 per hour.

(c) Overhead during the month amounted to Rs. 4,56,000.

(d) A total of Rs. 57,60,000 was budgeted for overhead for the year 2003-04 ,based on estimated production of the plants normal capacity of 48,000 dozen shirts annually .

Overhead at the level of production is 40% fixed and 60% variable. Overheads is applied on the basis of direct labour hours.

(e) There was no work-in-progress at the beginning of July. During July, lot nos. 45and 47 were completed. All material were issued for lots no. 46 which was 80% completed as regard conversion.

Required:

(A) Computation of standard cost of production of the shirts per dozen as well as in total for lot nos. 45, 46 and 47.

(B) Find out the variation in quantity of material used and labour hours worked of each lot as well as in total.

(C) Calculate the material price variance; labour rate variance; variable overhead efficiency variance and fixed overhead volume variance. (19 Marks) May/94

[Ans.: (A) Rs. 477.60 per dozen; (B) Total variation Material 235F, Labour 20A; (C) Material price variance Rs. 19000A; Labour rate variance Rs. 11000A; variable overheads efficiency variance Rs. 480A and fixed overheads volume variance Rs. 16320A]

Question 43: The standard cost sheet of a company based on the normal output of 30,000 units for a quarter is as under:

		(Rs.)
Direct material	(4Kg. @ 2 per Kg.)	8.00
Direct wages	(6 hour @Rs.4per hour)	24.00
Overhead	(50%of direct wages)	<u>12.00</u>
Total cost		44.00

Profit	<u>6.00</u>
Selling price	<u>50.00</u>

The budgeted fixed overhead amount to Rs. 1,44,000 per quarter and it is included in the overhead cost the basis of the budgeted activity of 36,000 units, the company estimated the profit for the second of the year as under :

	(Rs.)
Direct material	2,88,000
Direct wages	8,64,000
Overhead	<u>4,32,000</u>
Total cost	15,84,000
Sales	<u>18,00,000</u>
Profit	<u>2,16,000</u>

The cost records revealed the following actual for the second quarter of the year:

Production 25,000 units

Direct material consumed 96,000 Kg. at Rs. 2.25 per kg.

Direct wages paid 1,60,000 hours at Rs. 4.10 per hour. Out of which 6,000 hour being idle time were not recorded on production.

Overhead Rs. 3,32,000 out of which Rs.1,50,000 were fixed .

Sales 25,000 units at an average price of Rs. 51.50 per unit.

You are required to:

- Prepare a statement of actual Profit/Loss for the second quarter of the year.
- Analyse the variances and present on operating statement reconciling the budgeted profit with actual profit.

(19 Marks) Nov./94

[Ans.: Budgeted Profit: Rs. 216000; SVMV: Rs. 66000A; SPV: Rs. 37500F; MPV: Rs. 24000A, MUV: Rs. 8000F; LEff V: Rs. 16000; LRV: Rs. 16000; ITV: Rs. 24000; VOEV: Rs. 2800F, Voeff V: Rs. 4800A; FOEV: Rs. 6000A; VoeffV: Rs. 3200; FOCap.V: Rs 20800; Actual Profit: Rs. 83500]

Question 44: The overhead expense budget for a cost centre is as under:

Indirect material	Re.0.40 per hour
Indirect labour	Re.0.60 per hour
Maintenance	Re. 0.40 per hour
Power	Re. 0.30 per hour
Sundries	Re. 0.30 per hour
Total variable expenses	Rs. 2.00 per hour
Fixed overhead budgeted	Rs. 240

Budgeted output = 9,600 units or 120 standard hours.

At the end of a period the actual rates given by the accounts department are as under:

Power Re.0.32; maintenance Re.0.45; indirect labour Re.0.60; indirect material Re.0.50 and sundry expenses Re. 0.29 per hour; total variable expenses were Rs. 2.16 per hour. The actual output is 12,160 units for which the actual hours worked are 156. The fixed expenses amounted to Rs. 250. Compute the variances.

[Ans.: FOVV: 64F; FOBV: 10A; FOCV: 54F]

Question 45: Following is the standard cost card of a component:

Materials	2 Units at Rs. 15	Rs. 30
Labour	3 Hours at Rs.20	Rs. 60
Total overheads	3 Hours at Rs.10	Rs. 30

During a particular month 10,000 units of the component were produced and the same was found to be at 60% capacity of the budget. In preparing the variance report for the month, the cost accountant gathered the following information:

Labour	Rs.6,50,000
Variable overheads	Rs.2,00,000
Fixed overheads	Rs.3,00,000
Material price variance	Rs. 70,000 (A)
Material cost variance	Rs. 50,000 (A)
Labour rate variance	Rs. 50,000 (F)
Fixed overhead expenditure variance	Rs. 50,000 (A)

You are required to prepare from the above details:

- (1) Actual material cost incurred
- (2) Standard cost of materials actually consumed
- (3) Labour efficiency variance
- (4) Variable OH efficiency variance
- (5) Variance OH expenditure variance
- (6) Fixed OH efficiency variance
- (7) Fixed OH capacity variance
- (8) Fixed OH volume variance

[Ans.: (1) Rs. 350000; (2) Rs. 280000; (3) Rs. 100000A; (4) 25000A; (5) 25000A; (6) 25000A; (7) 75000A; (8) 100000A]

Question 46: The Standard Cost Card of producing one unit of Item 'Q' is as under:
Rs.

Direct material —	A - 12 Kg. @ Rs.10/-	120
	B - 5 Kg. @ Rs.6/-	30
Direct wages —	5 Hrs. @ Rs.3/-	15
Fixed production overheads		35
Total standard cost:		<u>200</u>
Standard gross profit		<u>50</u>
Standard sale price		<u>250</u>

Fixed Production overhead is absorbed on expected annual output of 13,200 units.
Actual results for the month of September, 1997 are as under:

Actual production :	1,000 units	
		Rs.
Sales	1,000 units @ Rs.250	<u>2,50,000</u>
Direct material	A □ 11,000 Kg.	1,21,000
	B □ 5,200 Kg.	28,600
Direct wages	□ 5,500 Hrs.	17,500
Fixed Overheads		<u>39,000</u>
		<u>2,06,100</u>
Gross profit		<u>43,900</u>

You are required to calculate all variances. Material price variance is taken out at the time of receipt of Material. Material purchased were:

12,000 Kg. of 'A' @ Rs.11 & 5,000 Kg. of 'B' @ Rs.5.50.

[Ans.: Material price variance Rs. 8400A; Material cost variance Rs 400F; Material usage variance Rs. 8800F; Material mix variance Rs. 1741.18F; Material Yield variance Rs. 7052.82; Material purchase price variance Rs. 9500A; Labour cost variance Rs. 2500A; Labour efficiency variable Rs. 1500A; Labour Price Variance 1000A; Fixed Overhead Expenditure variance Rs. 500A; Efficiency variable Rs. 3500A; Volume variance Rs. 3500A; Total fixed overhead cost variance Rs. 4000A]

Question 47: The following information is available in respect of Y Ltd. for a week :

- (a) 400 kg of raw material were actually used in producing product 'EXE'. The purchase cost thereof being Rs.24,800. The standard price per kg of raw material is Rs. 60. The expected output is 12 units of product 'EXE' from each kg of raw material. Raw material price variance and usage variance as computed by cost accountant are Rs. 800 (adverse) and Rs. 600 (adverse) respectively.

- (b) The week is of 40 hours. The standard time to produce one unit of 'EXE' is 30 minutes. The standard wage rate is Rs. 5 per labour hour. The company employs 60 workers who have been paid hourly wage rate as under :

Number of workers	:	6	8	46
Hourly wage rate (Rs.)	:	4.80	5.20	5.00

- (c) Budgeted overheads for a four-weekly period is Rs. 81,600. The actual fixed overheads spent during the said week are Rs. 19,800.
- (d) Entire output of 'EXE' has been sold at its standard selling price of Rs. 15 per unit. You are required to :
- Compute the variances relating to labour and overheads.
 - Prepare a statement showing total standard costs, standard profit and actual profit for the week.

[Ans.: Sales Rs. 70200; Standard profit Rs. 15210; Actual profit Rs. 13584]

Question 48: Stand cost Corporation produces three products A,B and C. The master budget called for the sale of 10,000 units of A at Rs. 12, 6,000 units of B at Rs. 15 and 8,000 units of C at Rs.9. In addition, the standard variable cost for each product was Rs. 7 for A, Rs.9 for B and Rs.6 for C. Infact, the firm actually produced and sold 11,000 units of A at Rs.11.50, 5,000 units of B at Rs. 15.10 and 9,000 units of C at Rs. 8.55.

The firm uses two input to produce each of the products X and Y. The standard price of material X is Rs.2 and for a unit of material Y is Re. 1. The materials budgeted to be used for each product were:

Products	Materials	
	X (units)	Y (units)
A	2	3
B	4	1
C	1	4

The firm actually used 54,000 units of X at a cost of Rs. 1,09,620 and 72,000 units of Y at a cost of Rs. 73,000.

Required:

Determine the mix, quantity and rate variances for sales as well as the yield, mix and price variance for materials.

[Ans.: Sales mix variance Rs. 5750A; Sales quantity variance Rs. 6000F, Sales rate variance Rs. 9050A; Sales margin mix variance Rs. 2583A; Sales margin quantity variance Rs. 9050A, Sales margin rate variance Rs. 7050A; Material Yield variance Rs. 1408A; Material mix variance Rs. 2592A; Material Price variance Rs. 2620A]

Question 49: The working results of a company for two corresponding years are shown below:

	Year 1 Rs. in lakhs	Year 2 Rs. in lakhs
Sales	1,200	1,540
Direct Material	600	648
Direct Wages and Variable Overheads	360	412
Fixed Overheads	160	300
	1,120	1,360
Profit	80	180

In year 2, there has been an increase in the selling price by 10%. Following are the details of material consumption and utilization of direct labour hours during the two years.

Year 1 Year 2

Direct Material Consumption in m/t	5,00,000	5,40,000
Direct Labour Hours	75,00,000	80,00,000

You are required to :

- Keeping year 1 as base year, analyse the results of year 2 and work out the amount which each factor has contributed to change in profit.
- Find out the break even sales for both years.
- Calculate the percentage increase in selling price that would be needed over the sale value of year 2 to earn a margin of safety of 45%.

[Ans.: (ii) BES: Yr. 1- Rs. 800 Lacs; Yr. 2- Rs. 962.50 Lacs (iii) 4.25%]

Question 50: X Ltd produces and sells a single product. The company carries no stock of materials, finished goods or work in progress. Its standard cost were revised at the end of 2003 for the new accounting year to 31st December, 2004, as follows:

Particulars	2003 Standard (Rs.)	2004 Standard (Rs.)
Direct materials (6 kgs @ Rs.3 per kg)	18	21.0
Direct labour (5 hrs @ Rs.4 per hr)	20	22.5
Production variable Overhead (5 hrs @ Rs.1 per hr)	5	6.3
Production fixed Overhead (5 hrs @ Rs.2 per hr)	10	10.8
	<u>53</u>	<u>60.6</u>
Sales price	60	66.0
Standard Profit	7	5.4

The budget in each year was to make and sell 24,000 units uniformly distributed per month.

The actual results of June of 2003 and June 2004 were exactly the same as follows:

	June 2003	June 2004 (Rs.)
Sales(2,000 units)		1,20,000
Cost of Production and Sales		
Direct Materials (12,600 kg)	36,540	
Direct labour	38,400	
Production variable overhead	11,520	
Production fixed overhead	22,000	1,08,460
		<u>11,540</u>

The operating statement of June 2003 was as follows:

Budgeted profit (2,000 units @ Rs.7)

Variances:

Material Price	1,260 (F)	
Material Usage	1,800 (A)	
Labour Efficiency	1,600 (F)	
Variable Overhead	1,520 (A)	
Fixed Overheads:		
Expenditure	2,000 (A)	
Efficiency	800 (F)	
Capacity	800 (A)	2,460 (A)
Actual Profit		<u>11,540</u>

You are required:

- To present the variances for the June 2004 in a similar operating statement.
- The production manager must decide whether or not to investigate the material usage variance in June 2004. He believes that there is a 0.3 probability that the variance is controllable but the cost of the investigating the matter would be Rs.90 and a further Rs.120 would be incurred if control action is found to be necessary. Determine what must be the minimum expected benefits from the control action to justify investigation of the material usage variance?

[Ans.: Budgeted Profit for June'04 – 10800]

Question 51: Standard Cost Card of a product is as under:

Direct Materials	(Rs)
A 2kg @ Rs. 3 per kg	6.00

B 1kg @ Rs.4 per kg	4.00
Direct Wages 5 hours @ Rs. 4 per hour	20.00
Variable overheads 5 hours @ Rs.1 per hour	5.00
Fixed overheads 5 hours @ Rs.2 per hour	10.00
Total	45.00
Standard Profit	5.00
Standard Selling Price	50.00

Budgeted output is 8,000 per month.

In October 2004, the company produced and sold 6,000 units. The actual sales value was Rs.3,05,000. Direct materials consumed was: Material A 14,850 kg valued at Rs.43,065 and Material B 7,260 kg valued at Rs.29,750. The total direct labour hours worked was 32,000 and wages paid therefore amounted to Rs.1,27,500. The direct labour hours actually booked on production was 31,800. Overheads recorded were: Fixed Rs.80,600 and Variable Rs.30,000. Closing work-in-progress was 600 units in respect of which metals A and B were fully issued and labour and overheads were 50% complete.

Analyse the variances and present an operating statement showing the reconciliation between budgeted and actual profit for the month in the following format.

Operating Statement

(Rs.)

Budgeted Profit
Sales Variance
Price
Volume
Total
Cost Variance
Direct Materials
Price
Yield
Mix
Direct Wages
Rate
Efficiency
Idle time
Variable Overheads
Expenses
Efficiency
Fixed Overheads
Expenses
Efficiency
Idle time
Capacity
Total Cost Variance
Actual Profit

[Ans.: Actual Profit-Rs.10585, Budgeted Profit-Rs. 40000; Equivalent units: DM-6600 & DL-6300]

Question 52: The Standard cost card per unit of output of Product K produced by a firm is as under: (Rs)

Direct Material	A. (10kg @ Rs.10)	100
	B. (5 kg @ Rs.3)	15
Direct wages	(5 hrs. @ Rs.3)	15
Fixed production overheads		25
Total Standard Cost		155
Standard Gross Profit		45
Standard Selling Price		200

The fixed production overheads has been absorbed on the expected annual output of 10,800 units produced at a an even flow throughout the year.

During the month of November 2004, the following were the actual results for an actual production of 800 units

Sales 800 units @ Rs.200	1,60,000
Direct Material	
A 7,800 kg	79,950
B 4,300 kg	11,825
Direct wages 4,200 hours	12,075

Fixed overheads	23,500
Total	1,27,350
Gross profit	32,650

The material price variance is extracted at the time of receipt of materials. Materials purchased were A. 9,000kg @ Rs.10.25 per kg; B 5,000 kg @ Rs.2.75 per kg.

Required:

- Calculate all variances.
- Prepare an operating statement showing the standard gross profit, variances and the actual gross profit.
- Explain the reason for the difference in the actual gross profit given above and the actual gross profit arrived at by you.

[Ans.: Sales-Rs. 160000; Std. Cost of Sales-Rs. 124000; Actual Profit-Rs. 32525; Actual Profit (On Issue Basis)-Rs. 32650]

Question 53: A small company, making a single product, produces accounts for a costing period, as following: (Rs)

Direct Material	792	
Direct Wages	1,192	
Variable Overhead	1,940	
Fixed Overhead	1,040	4,964
Profit		976
Sales		5,940

The original budget was in respect of 1,000 per period, but during this period only 960 units were produced and sold.

Standard direct wages rate is Rs0.60 per hour and standard variable overhead rate is Rs.1 per hour.

Cost variances during the period are as follows:

Particulars	Gains	Losses
Material Price	-	8
Material Usage	-	16
Wage rate	20	-
Labour Efficiency	-	60
Variable Overhead Expenditure	80	-
Variable Overhead Efficiency	-	100
Fixed Overhead Cost	-	40
Sales Price	180	-

From the above information, prepare for the period the original budget and a flexible budget for the sales achieved.

[Ans.: Sales: Std. Cost p.u.: Rs. 6; Original Budget (1000 units): 6000; Flexible Budget (960 units): 5760]

Question 54: The accountant of a company has presented the following operating statement to the General Manager of Department 'P' for the month of May 2004. (Rs)

Particulars	Budget	Actual May 2004	Variance
Sales	24,00,000	22,00,000	2,00,000
Direct Materials	6,00,000	5,20,000	80,000
Direct Labour	8,00,000	7,56,000	44,000
Factory Overheads (V)	2,00,000	1,84,000	16,000
Factory Overheads (F)	1,00,000	1,16,000	(16,000)
Selling Overheads (V)	3,00,000	2,88,000	12,000
Selling Overheads (F)	2,00,000	1,84,000	1,60,000
Total	22,00,000	20,48,000	1,52,000
Profit	2,00,000	1,52,000	(48,000)
Direct Labour Hours	1,00,000	95,000	
Units of Production and Sale	20,000	18,000	

The general manager was surprised to see that his operation have resulted in the adverse profit variance of Rs.48,000 for the month. On the basis of the budgeted profit of Rs.10 per unit, he expected that he would make a profit of Rs.1,80,000 on a sale of 18,000 units of production in May 2004 instead of the budgeted profit of Rs2,00,000 resulting in an adverse profit variance of Rs.20,000 only.

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- (a) Redraft the above statement to show the original budget, flexible budget, actual expenses incurred and variations for May 2004.
 (b) Calculate all variance relating to sales, direct material, direct labour and overheads.

[Ans.: Net Profit- Original Budget: 200000; Flexible Budget: 150000; Actual: 152000]

Question 55: The following information is available from the record of Sunrise Ltd. which produces only one product:

Budgeted Income Statement: January 1995

	Rs.	Rs.	Rs.
Sales Revenue: (20,000 units at Rs.5)			1,00,000
Production Costs:			
Budgeted production 20,000 units			
Direct Materials:			
A (10,000 Kg. @ Rs.0.30)	3,000		
B (10,000 Kg. @ Rs.0.70)	7,000	10,000	
Direct Labour			
Skilled (9,000 Hrs @ Rs.3.00)	27,000		
Un-skilled (5,200 Hrs @ Rs.2.50)	13,000	40,000	
Production Overhead:			
Fixed		20,000	
Variable (20,000 units @ Rs.0.50)		10,000	
		80,000	
Add: Opening Stock (1,000 units @ Rs.4.00)		4,000	
		84,000	
Deduct Closing Stock (1,000 units @ Rs.4.00)		4,000	
			80,000
Budgeted Profit			20,000

During January 1995 production and sales were both above budget and the following income statement was prepared:

Budgeted Income Statement: January 1995

	Rs.	Rs.	Rs.
Sales Revenue:			
(14,000 units at Rs.5)			70,000
(8,000 units at Rs.4.75)			38,000
			1,08,000
Production Costs:			
Actual production 24,000 units			
Direct Materials:			
A (16,000 Kg. @ Rs.0.20)	3,200		
B (10,000 Kg. @ Rs.0.80)	8,000	11,200	
Direct Labour			
Skilled (13,000 Hrs @ Rs.2.95)	38,350		
Un-skilled (6,300 Hrs @ Rs.2.60)	16,380	54,730	
Production Overhead:			
Fixed		18,020	
Variable (24,000 units @ Rs.0.625)		15,000	
		98,950	
Add: Opening Stock (1,000 units @ Rs.4.00)		4,000	
		1,02,950	
Less: Closing Stock (3,000 units @ Rs.4.00)		12,000	
		90,950	
Budgeted Profit			17,050

During the period 1,000 abnormal idle hours for skilled labour due to machine breakdown was reported. In the above statement stock is valued at standard cost of Rs.4 per unit.

Required:

Prepare a standard costing statement analyzing the differences between the budget and the actual performance. In your analysis include calculations of the sales volume and sales price variances; direct material price, mix, yield and usage variances; direct labour rate, idle time and efficiency variances; overhead expenditure and volume variances. (19 Marks) Nov./95

[Ans.: Sales volume margin variance Rs. 2000F; Sales margin price variance Rs. 2000A; Material price variance Rs. 600F; Material mix variance Rs. 1200F; Material yield variance Rs. 1000A; Labour rate variance Rs. 20F; Labour Efficiency variance Rs. 3750A; Idle time variance Rs. 3000A; Variable overheads exp. Variance Rs. 3000A; Fixed overheads Exp. Variance Rs. 1980F; Fixed overhead volume variance Rs. 4000F]

Question 56: GLOBAL LTD. is engaged in marketing of wide range of consumer goods. A, B, C and D are the zonal sales officers for four zones. The company fixes annual sales target for them individually.

You are furnished with the following:

- (i) The standard cost of sales target in respect of A, B, C and D are Rs.5,00,000, Rs.3,75,000, Rs.4,00,000 and 4,25,000 respectively.
- (ii) A, B, C, and D respectively earned Rs.29,900, Rs.23,500, Rs.24,500 and Rs.25,800 as commission at 5% on actual sales effected by them during the previous year.
- (iii) The relevant variances as computed by a qualified cost accountant are as follows:

Particulars	A	B	C	(Rs.) D
Sales price variance	4,000(F)	6,000(A)	5,000(A)	2,000(A)
Sales volume variance	6,000(A)	26,000(F)	15,000(F)	8,000(F)
Sales margin mix variance	14,000(A)	8,000(F)	17,000(F)	3,000(A)

(A)= adverse variance and (F) = Favourable variance

You are required to :

- (i) Compute the amount of sales target fixed and the actual amount of contribution earned in case of each of the zonal sales officer.
- (ii) Evaluate the overall performance of these zonal sales officers taking three relevant base factors and then recommend whose performance is the best.

[Ans.: Actual Margin/Sales-15.05; 16/38; 18.78; 15.50; Rank: IV; II; I; III]

Question 57: Explain the problems concerning control of operations that a manufacturing company can be expected to experience in using a standard costing system during periods of rapid inflation (May 1997)

Ans.: The problems concerning control of operations that a manufacturing company can be expected to experience in using a standard costing system during periods of rapid inflation are as follows:

- (i) The formulation/setting of material standards makes assumptions about the inflation, which will prevail in future, if this assumption is not stated clearly then it is difficult to determine how much of price variance is due to inflation and how much is due to buying efficiency.
- (ii) Price indices tend to reflect average price changes. Consequently, it is difficult for a company to predict future costs and interpret variances if the specific rate of inflation for its inputs is considerably different from the general rate of inflation.
- (iii) Inflation may result in relative changes in the prices of inputs. Therefore, standard mixes requiring different inputs may no longer be the most efficient mix.
- (iv) If standard prices are not adjusted then the efficiency variances will be understated.
- (v) Sharp rises in prices will raise questions as to whether unadjusted standards can be used in the decision making process (eg. Pricing decisions).
- (vi) Administrative work involved in maintaining upto-date standards when prices are constantly changing will increase.

Behavioural aspects of Standard Costing

1. Projection of fixed overheads and estimated selling price in a Standard Cost Sheet is a circular exercise with no added value.

In an award winning article, "COST / MANAGEMENT ACCOUNTING: THE 21ST CENTURY PARADIGM", published in Management Accounting (USA), December 1995, William L Ferrara argues that while preparing a Standard Cost Sheet, one of the objectives of which is to assist management in pricing products, a professional cannot project fixed overheads until and unless he is aware of the production quantum to be effected. The forecast of future production can only be made if a tentative selling price of the product is known because, in a competitive market, it is the selling price which decides the sale quantity and therefore the production volume. The authors contend that in case the selling price is known at the time of projecting fixed overheads then the re computation of the same is a valueless exercise.

2. Traditional costing tools like standard costing induce a static behaviour in the employees.

During the past decade and a half, various writers such as Johnson and Kaplan, Ferrara and Monden etc have questioned the productivity and use of traditional systems such as standard costing and variance analysis. They argue that the use of standard costing renders employees static and curbs innovation and that

companies following traditional standard costing find it difficult to improve upon standards because of severe resistance from employees who are convinced that the established best practise cannot be improved further.

3. Fear of adverse variances forces managers to give undue importance to material price, labour rate and efficiency and capacity utilisation. These concepts are detrimental to the modern day world class manufacturing environment characterized by concepts of JIT and TQM.

In a World Class Manufacturing environment, characterised by Just in Time policies, the focus of the management is to produce only as much as is required. This requires purchase of small quantities of raw material, increase in the number of set ups and minimal importance to capacity utilisation. Policies like this result in increased adverse variances related to raw material prices, labour efficiency and production volume. Critics argue that the fear of such adverse variances affects goal congruence and forces managers to behave against their company's policies.

4. Traditional costing does not provide the management with what is the allowable cost; rather it emphasises on the standard or actual costs.

This is looked upon as one of the major reasons for lack of innovation especially in the global era where competition amongst companies is unprecedented. It is argued that techniques like Target costing are much more motivating when compared to Traditional costing since the former encourage the use of concepts like value engineering and value analysis.

Question 58: "Overhead variances should be viewed as interdependent rather than independent". Explain.

Ans.: The operations of a firm are so inter linked that the level of performance in one area of operation will affect the performance in other areas. Improvements in one area may lead to improvements in other areas. A sub-standard performance in one area may be compensated by a favourable performance in another area. Because of such interdependency among activities in the firm, the managers should not jump to conclusions merely based on the label of variances namely favourable or unfavourable. They should remember that there is a room for trade off amongst variances. Hence, variances need to be viewed as 'attention directors' rather than problem solvers. Thus, a better picture will be captured when overhead variance are not viewed in isolation but in an integrated manner.

(4 Marks) May/02

Budget and Budgetary Control (incl'd. Key factor analysis & Throughput A/cing)

Key Factor/Limiting Factor

A key factor is defined as the factor in the activities of an undertaking which, at a particular point of time or over a period, will limit the volume of output. Other variant terms are limiting factor, Principal Budget Factor & scarce factor. Limiting factors are governed by both internal & external factors. It may be actual or potential. If a factor of production is in short supply, then the best-paying product becomes that which yields the highest contribution per unit of limiting factor.

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key Factor}}$$

Thus, Contribution per unit of key factor may be ascertained & maximized according to priority (ranking).

Some examples of key factors are:

- I. Materials-Scarce Raw Material; Restrictions by licenses, etc.
- II. Labour-General Shortage; Shortage of a particular type of labour.
- III. Plant-Imbalance; Insufficient capacity due to shortage of capital, supply, etc.
- IV. Management-Shortage of efficient staff; policy decisions.
- V. Capital-Shortage of capital; insufficient research activity
- VI. Sales-Market demand; insufficient advertisement.

Important Note: If no limiting factor is provided in question, but still we need to rank the products for better allocation, we shall take CONTRIBUTION PER UNIT as base for ranking.

Question 1: A company manufactures and markets three products P, Q and R. All three products are made from the same set of machines. Production is limited by machine capacity.

From the data given below, indicate priorities of products P, Q and R with a view to maximizing profits:

	PRODUCT		
	P	Q	R
Raw material cost per unit	(Rs.)11.00	16.25	21.00
Direct labour cost per unit	(Rs.) 2.50	2.50	2.50
Other variable cost per unit	(Rs.)1.50	2.25	3.50
Selling price per unit	(Rs.)25.00	30.00	35.00
Standard machine time required per unit in minutes	40	20	25

[Ans.: P-III; Q-I; R-II]

Question 2: Jupiter Enterprises Ltd. is manufacturing three products A, B and C using the same raw materials. All the products pass through departments I, II and III. Relevant details of the current production plan are as follows:

	Products		
Standard cost per unit	A	B	C
Direct materials	Rs.40	Rs.50	Rs.64
Direct labour:			
Dept. I(Rate-Rs.10/hr)	1 hr	1.2 hrs.	1.5 hrs.
Dept. II(Rate-Rs.12/hr)	0.5 hr	1 hr	1 hr
Dept. III(Rate-Rs.15/hr)	0.8 hr	1 hr	1.2 hrs.
Variable overhead	Rs.12	Rs.11	Rs.16
Current annual production (units)	30,000	40,000	25,000
Selling price per unit	Rs.100	Rs.130	Rs.175
Forecast of sales (max. units)	50,000	40,000	30,000

Fixed overheads per annum – Rs.25 lakhs.

The labour available in department II is in short supply and cannot be increased in the near future. The Managing Director has doubts about the correctness of the product mix proposed above. He has requested you to examine the current production plan and give your specific recommendation.

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- (a) To state whether the suggested product mix is the optimum one in the circumstances stated above: if not, which is the optimum mix? Show workings;
 (b) To indicate increase in profit, if any, if your suggestion is implemented. ICWA-June/97

[Ans.: (a) Suggested product mix is not optimum; (b) Increase in profit is Rs. 2 lakhs]

Question 3: A company producing products "PIE" and "SIGMA" using a single production process, has the following cost data:

	PIE	SIGMA
Selling price per unit (Rs.)	20	30
Variable cost per unit (Rs.)	11	16
Machine hours required per unit production (hrs.)	1	2
Market limitation (units)	1 lakh	2.5 lakhs
Total machine hours available -4 lakhs.		
Fixed cost per annum-Rs.26 lakhs		

Considering the limiting factors of machine hours and market limitations, you are required to

- (a) Indicate the best combination of products to give optimum contribution;
 (b) Show the additional machinery requirement to be augmented on rental basis at an annual rent of Rs.1.5 lakhs per machine to provide additional capacity of 30,000 hours per machine;
 (c) Change in number of machines to be rented if the annual rental charges reduce to Rs.1, 25,000 per machine.

[Ans.: (a) Pie: 100000 units; Sigma: 150000 units; (b) 7 machines are to be taken on rental (c) No change in the no. of machines required on rental basis]

Question 4: Mega Corporation manufactures and sells three products to the automobile industry. All the products must pass through a matching process, the capacity of which is limited to 20,000 hours per annum, both by equipment design and government regulation. The following additional information is available:

	Product - X	Product - Y	Product - Z
Selling price Rs/unit	1,900	2,400	4,000
Variable cost Rs/unit	700	1,200	2,800
Machining requirement hrs/units	3	2	1
Maximum possible sales – units	10,000	2,000	1,000

Required : statement showing the best possible production mix which would provide the maximum profit for Mega Corporation together with supporting workings.

[Ans.: X :5000; Y: 2000; Z: 1000]

Question 5: A firm can produce three different products from the same raw material using the same production facilities. The requisite labour is available in plenty at Rs.8 per hour for all products. The supply of raw materials, which is imported at Rs.8 per kg. is limited to 10,400 kgs. for the budget period. The variable overheads are Rs.5.60 per hour. The fixed overheads are Rs.50,000. The selling commission is 10 per cent on sales.

a. From the following information, you are required to suggest the most suitable sales mix, which will maximize the firms profits. Also determine the profit that will be earned at that level:

Product	Market demand (units)	Selling price per Unit	Labour hours required per Unit	Raw Material required per Unit (Kgs)
X	8,000	30	1	0.7
Y	6,000	40	2	0.4
Z	5,000	50	1.5	1.5

b. Assume, in above situation, if additional 4,500 kgs of raw materials is made for production, should the firm go in for further production, if it will result in additional fixed overheads of Rs.20,000 and 25% increase in the rates per hour for labour and variable overheads ?

[Ans.: X : 8000, Y : 6000, Z : 1600 with Profit = 66160; Additional Net Profit = 2500]

Question 6: Super Forging Ltd. is manufacturing three household products A, B and C and selling them in competitive market. Details of current demand, selling price and cost structure are given below:

Particulars	A	B	C
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Expected demand (units)	10000	12000	20000
Selling price per unit (Rs.)	20	16	10
Variable cost per unit (Rs.)			
Direct Materials (Rs. 10/kg)	6	4	2
Direct Labour (Rs. 15/hr.)	3	3	1.50
Variable Overheads	2	1	1
Fixed Overhead per unit (Rs.)	5	4	2

The company is frequently affected by acute scarcity of raw material and high labour turnover. During the next period it is expected to have one of the following situations:

- Raw materials available will be only 12100 kg.
- Direct labour hours available will be only 5000 hrs.
- It may be possible to increase sales of any one product by **25%** without any additional fixed costs but by spending Rs.20000 on advertisement. There will be no shortage of materials or labour.*

Suggest the best production plan in each case and the resultant profit that the company would earn according to your suggestion. ICWA-June/98

[Ans.: Net Profit (a) 117500 (b) 102000 (c) 165500]

[Hint: In part (c) of above mentioned question since we have been provided % increase in units we shall opt the product which is going provide us highest increment in total contribution.

Now since total increase in contribution is

$$A: 10000 \times 25\% \times 9 = \text{Rs. } 22500$$

$$B: 12000 \times 25\% \times 8 = \text{Rs. } 24000$$

$$C: 20000 \times 25\% \times 5.5 = \text{Rs. } 27500$$

Hence we are supposed to increase sales of Product C (P/V ratio is not supposed to be seen in such cases).

However, if inspite of % increase, absolute value of increase in unit would have been provided, we would choose Contribution per unit as our base of ranking. For example if in above it would have asked that "It may be possible to increase sales of any one product by **2500 units** without any additional fixed costs but by spending Rs.20000 on advertisement. There will be no shortage of materials or labour."

In such cases we will rank our products on the basis of contribution per unit, hence we are supposed to increase sales of Product A inspite of product C because, it is ultimately lead with highest increase in contribution.]

Question 7[Sales mix with two key factors]: Arvind Electronics is a small scale unit manufacturing three standard electronic components A, B and C .Current selling price and costs are as follows:

	A	B	C
Selling price per unit	Rs.28	Rs.60	Rs.125
Direct materials	8	15	20
Direct labour (@ Rs.10/hr.)	10	20	50
Variable overheads	5	10	25

Fixed overheads are budgeted at Rs.25, 000 per annum. Direct labour availability is limited to 11,000 hours only per year. The company has agreed to supply a minimum of 500 units of each of these products. Current production plan of the company envisages supply of the minimum requirements and using the surplus labour hours for production and sale of 'C' which has the highest margin.

Required:

- Profit according to current plan.
- Alternative plan, if any, for maximum profit.
- Break-even point in terms of units and sales value based on our calculations in (b).
- Number of units and sales value required in respect of each of the above three products to earn 24% profit after tax on capital employed of Rs.1,00,000. Tax rate applicable to the firm is 50%.

[Ans.: (a) Rs. 42000 (b) Profit will be Rs. 52500 (c) 1500 units & Rs. 106500 (d) A: 500 units & Rs. 14000; B: 3700 units & 222000; C: 500 & 62500]

Question 8: A farmer asks your recommendation for optimal mix of production for the coming year. The current data is given below

	ITEMS PRODUCED			
	A	B	C	D
Area occupied (acres)	25	20	30	25
Yield per acre (tones)	10	8	9	12

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Sales price per tonne (Rs.)	1,000	1,250	1,500	1350
Variable cost per (acre)				
Material (Rs.)	700	600	950	900
Labour (Rs.)	2,000	2,500	3,000	3,700
Variable overheads (Rs.)	2,000	2,000	2,000	2,000
Fixed overhead	Rs.			
Cultivation and growing	1,00,000			
Harvesting and transport	2,40,000			
Land revenue	90,000			
Administration	1,10,000			
Total	5,40,000			

The land which is being used for producing items A and B can be used for either of the items but not for items C and D. The land which is being used for producing items C and D can be used for either items but not for items A and B.

In order to provide adequate market service, the farmer must produce each year at least 40 tonnes each of A and B and 36 tonnes each of C and D.

You are required to calculate the following:

- The profit for the current year; and
- The profit for the production mix which you could recommend.

[Ans.: (a) Rs. 157000; (b) Rs. 216300]

Question 9: Household Equipments Ltd. is producing a kitchen equipment from five components, three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment is as follows:

Components	A	B	C	D	E	Total
Machine Hours regd. per unit	10	14	12	-	-	36
Labour Hours regd. Per unit	-	-	-	2	1	3
Variable cost per unit (in Rs.)	32	52	58	12	6	160
Fixed cost per unit (apportioned)	48	102	116	28	34	316
Total component cost	80	156	174	36	36	476
Assembly cost /unit (all variable)						Rs.40
Selling price /unit						Rs.600

The marketing department for the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture A, B and C is already working to the maximum capacity of 4,752 hours and there is no possibility of increasing this capacity during the next period. But, labour is available for making components D and E also for assembly according to demand. The management is considering the purchase of one of the components A, B or C from the market to meet the increase in demand. These components are available in the market at the following prices;

Component A	:	Rs. 80
Component B	:	Rs.160
Component C	:	Rs.125

Required

- Profit made by the company from current operations.
- If the company buys any one of the components A, B or C, what is the extent of additional capacity that can be created?
- Assuming 50% increase in demand during the next period, which component should buy from the market?
- The increase in profit, if any, if the component suggested in (c) is purchased from the market.

[Ans.: (a) Rs. 11088; (b) A: 38.5% B: 63.6% C: 50% (c) Product C (d) Increase in profit Rs. 13134]

Question 10: A consumer goods manufacturer uses large volume of tin containers, which are sold on a returnable basis to their local distributors, who are required to deposit Rs.25% per tin, refundable on return of the tins. The company incurs a cost of Rs.32 per tin, which, depending upon its condition on return, can be used six to eight times. Unusable tins are sold as scrap at Rs.8 per tin, normally, 15,000 tins are scrapped each month.

The company has received a suggestion from an employee to convert such scrapped tins into usable lids for the container, as a cost reduction proposal. Following data is available concerning this proposal:

- Each rejected tin can be converted into 5 lids of acceptable quality, after rejections.
- Cost of conversion into lids is Rs.50 per 100 pcs.
- Each tin weighs 1 kg and each lid weighs 120 gms.
- Scrapped lids and other off-cuts of the tin can be sold @ Rs.5/kg.
- Company's requirement of lids is one lakh per month, which it currently buys at Rs.2 per pc.

Required:

- An evaluation of the proposal, with supporting working and your recommendation whether or not to accept the proposal.
- A statement of estimated savings that will accrue to the company, if the proposal is accepted.

[Ans.: (a) Proposal should be accepted (b) Savings of Rs. 270000]

Question 11: M/s Mars Ltd. is manufacturing three products. The cost details are as follows:

Particulars	Products					
	A		B		C	
	Units	Rs.	Units	Rs.	Units	Rs.
Direct Materials	4	12	5	15	6	18
Direct Labour		5		6		6
Direct Expenses		8		9		11
		25		30		35
Selling Price		35		40		50
		10		10		15
No. of Units sold	20,000		40,000		20,000	
Total Contribution	2,00,000		4,00,000		3,00,000	
Total		Rs.9, 00,000				
Less: Fixed Costs		Rs.7, 50,000				
		Rs.1, 50,000				

The direct materials were all imported. Due to foreign exchange restrictions, henceforth, *the company can import only 3,00,000 units of raw materials*. The company can produce in all 1,00,000 units maximum (all products). However, they can market only 20,000 units each of product A and C. There is a local substitute material which is available at a price of Rs.3.75 per unit. Besides, the company has to spend Rs.50, 000 on intermediaries and consumables, if local substitute material is used in the production process. There was also a third party who was willing to take a part o the plant on lease up to 50,000 units capacity of B and willing to pay lease charges of Rs.2,75,000.

You are required to advise the management:

- What should be the quantum of production/sales mix of products with existing import restrictions?
- Whether the company can optimize production of 1,00,000 units with local substance materials?
- Whether the company can enhance profits by leasing out a part of the plant to the third party and restricting its own production?

Question 12: Stirling Industries Ltd., manufactures a product 'Z' by making and assembling three components A, B and C. The components are made in a machine shop using three identical machines each of which can make any of the three components. However, the total capacity of the three machines is only 12,000 machine-hours per month and is just sufficient to meet the current demand. Labour for assembling is available according to requirements. Further details are given below:

Components	Machine-house required per unit	Variable cost per unit	Market price at which the component can be purchased if required
A	4	Rs.48	Rs.64
B	5	60	75
C	6	80	110
Assembling	-	30 (per unit of z)	-

Fixed costs per month amount to Rs.50,000. Product 'Z' is sold at Rs.3.00 per unit.

From net month onwards. The company expects the demand for 'Z' to rise by 25%.As the machine capacity is limited, the company wants to meet the increase in demand by buying such numbers of A, B or C which is most profitable.

You are asked to find out the following:

- Current demand and profit made by the company.

- (b) Which component and how many units of the same should be bought from the market to meet the increase in demand?
 (c) Profit made by the company if suggestion in (b) is accepted.

[Ans.: Profit-Rs. 15600 (b) Balance 600 units of B should be purchased from market (c) Rs. 23000]

Question 13: The following particulars are taken from the records of a company engaged in manufacturing two products, A and B, from a certain material:

	Product A (per unit) Rs.	Product B (per unit) Rs.
Sales	2,500	5,000
Material cost (Rs.50 per kg)	500	1,250
Direct labour (Rs.30 per hour)	750	1,500
Variable overhead	250	500

Total fixed overhead: Rs.10, 00,000

Comment on the profitability of each product when:

- (i) Total sales in value is limited.
 (ii) Raw material is in sort supply.
 (iii) Production capacity is the limiting factor.
 (iv) Total availability of raw materials is 20,000 kg. and maximum sales potential of each product is 1,000 units, find the product mix to yield maximum profits.

[Ans.: (i), (ii) & (iii) Product A is more profitable (iv) A: 1000 units; B: 400 units to yield a profit of Rs. 700000]

Question 14: Atlas Engineering Company Ltd. is currently working at 60% of its installed capacity, maintaining a contribution/sales ratio of 31.25%. For the coming year, it is awaiting an additional order which will raise capacity utilization to 80%.Accordingly, it has prepared flexile budgets at 60% and 80% for next year, vide details given below:

	Capacity utilization	
	60% Rs.	80% Rs.
Direct materials	32,50,000	43,00,000
Direct labour	12,00,000	16,00,000
Electric power	1,20,000	1,60,000
Consumables	2,40,000	3,20,000
Repairs and maintenance	2,10,000	2,30,000
Indirect labour	4,50,000	6,00,000
Administrative expenses	3,00,000	3,00,000
Salaries	4,00,000	4,00,000
Selling and distribution expenses	2,20,000	2,60,000
Depreciation	3,00,000	3,00,000
Miscellaneous expenses	1,10,000	1,30,000
Total	68,00,000	86,00,000

Required:

- (a) Current sales and profit.
 (b) Current break-even sales.
 (c) Price to be quoted for the new order, if contribution / sales ratio is to be maintained at current rate.
 (d) If the raw material used by the company is in short supply, what maximum price should the company quote for the new order?

[Ans.: (a) Sale: Rs. 7854545; (b) BES: Rs. 4480000; (c) & (d) Rs. 2618182]

Question 15: A Company manufactures and sells three products A, B and C as per details given below:

	Products		
	A	B	C
Direct materials	Rs.20	Rs.16	Rs.18
Direct labour	12	14	12
Variable overheads	8	10	6
Fixed overheads	6	6	4
	46	46	40
Profit	18	14	12
Selling Price	64	60	62
Sales (Units)	10,000	5,000	8,000

- (a) Rank the products according to the profitability. What is the profit currently earned by the company?
- (b) Production arrangements are such that if one of the products is discontinued, sales of the other two can be increased by 50%. Management wants to discontinue 'C' as its contribution is least. Do you agree? Present your recommendation supported by suitable analysis.
- (c) There is also a proposal to introduce a highly profitable product 'D' using the existing facilities, along with the two products retained at the original level of production. The details relating to product 'D' are as follows:

	Variable cost per unit(Rs)	Selling price / unit
Direct Materials	12	Rs.48 (proposed)
Direct Labour	8	
Variable overheads	5	

Demand for 'D' is uncertain. Management wants to know the minimum sales that would ensure the maximum profit as per (b). Give you recommendation, supported by workings.

[Ans.: (a) A-I; B-III; C-II with Profit of 3.46 lakhs; (b) C should not be discontinued. Product B should be discontinued, then profit will improve to Rs. 430000 (c) Minimum Sales = 8000 units to ensure max. profit of Rs. 430000]

Question 16: A company manufactures and sells three products P,Q,R whose unit selling price and cost details are given below:

	P	R	Q
Selling price/unit (Rs.)	80	60	50
Direct materials /unit (Rs.)	32	25	20
Direct labour/unit (Rs.)	20	15	10
(@ Rs.10/hr.)	10	9	6
Variable overheads/unit (Rs.)			
Total budgeted Fixed Overheads per annum Rs.5,50,000			
Current sales (Units)	15,000	20,000	10,000

Required:

- (a) Profit earned by the company p.a. according to estimates.
- (b) Assuming that the company as only 75,000 labour hours per year, is it advisable to increase production/sales of any one of the products by a maximum of 25% only by spending an additional amount of Rs.30,000 on advertisement/if so, which product should be chosen and what would be the expected profit?
- (c) A reduction of selling price by 5% will boost up sales of all products by 50%. But, direct labour hours would continue to be 75,000. What is the best product mix for this proposition? Would you recommend this option? Show workings.

[Ans.: (a) Rs. 80000 (c) No]

Question 17[Specific and avoidable fixed cost]: Bloom Ltd. makes 3 products, A, B and C. The following information is available:

	(Figures in Rupees per unit)		
	A	B	C
Selling price (peak-season)	550	630	690
Selling price (off-season)	550	604	690
Material cost	230	260	290
Labour (peak-season)	110	120	150
Labour (off-season)	100	99	149
Variable production overhead	100	120	130
Variable selling overhead (only for peak-season)	10	20	15
Labour hours required for one unit of production	8	11	7 (hours)

Material cost and variable production overheads are the same for the peak-season and off-season. Variable selling overheads are not incurred in the off-season. Fixed costs amount to Rs. 26,780 for each season, of which Rs. 2,000 is towards salary for special technician, incurred only for product B, and Rs. 4,780 is the

amount that will be incurred on after-sales warranty and free maintenance of only product C, to match competition.

Labour force can be interchangeably used for all the products. During peak-season, there is labour shortage and the maximum labour hours available are 1,617 hours. During off-season, labour is freely available, but demand is limited to 100 units of A, 115 units of B and 135 units of C, with production facility being limited to 215 units for A, B and C put together.

You are required to:

(i) Advise the company about the best product mix during peak-season for maximum profit.

(ii) What will be the maximum profit for the off-season? (12 Marks) Nov/08-New Course

[Ans.: (i) Best strategy for peak-season is to produce 202 units of A. (ii) Maximum profit for off-season Rs. 4,375.]

Question 18 [Sales mix with two key factors]: An agriculturist has 480 hectares of land on which he grows potatoes, tomatoes, peas and carrots. Out of the total area of land, 340 hectares are suitable for all the four vegetables but the remaining 140 hectares of land are suitable only for growing peas and carrots. Labour for all kinds of farm work is available in plenty.

The market requirement is that all the four types of vegetables must be produced with a minimum of 5000 boxes of any one variety. The farmer has decided that the area devoted to any crop should be in terms of complete hectares and not in fractions of a hectare. The only other limitation is that not more than 113750 boxes of any one vegetable should be produced.

The relevant data concerning production, market prices and costs are as under:

	Potatoes	Peas	Carrots	Tomatoes
Annual yield:				
Boxes per hectare	350	100	70	180
Costs:				
Direct material per hectare	Rs. 952	Rs. 432	Rs. 384	Rs. 624
Direct Labour:				
Growing per hectare	1792	1216	744	1056
Harvesting and packing per box	7.20	6.56	8.80	10.40
Transport per box	10.40	10.40	8.00	19.20
Market price per box	30.76	31.74	36.80	44.55
Fixed expenses per annum:				
Growing Rs.	124000			
Harvesting	75000			
Transport	75000			
General administration	150000			

It is possible to make the land presently suitable for peas and carrots, viable for growing potatoes and tomatoes if certain land development work is undertaken. This work will involve a capital expenditure of Rs. 6000 per hectare which a bank is prepared to finance at the rate of interest of 15% p.a. If such improvement is undertaken, the harvesting cost of the entire crop of tomatoes will decrease on an average by Rs. 2.60 per box.

Required:

- Calculate, within the given constraints, the area to be cultivated in respect of each crop to achieve the largest total profit and the amount of such total profit before land development work is undertaken.
- Assuming that the other constraint continues, advise the grower whether the land development scheme should be undertaken and if so the maximum total profit that would be achieved after the said development scheme is undertaken.

Nov./88

[Ans.: (i) Potatoes-312 hectares; Peas-50 hectares; Carrots-90 hectares; Tomatoes-28 hectares with profit of 20116240 (ii) Potatoes-325 hectares; Peas-50 hectares; Carrots-72 hectares; Tomatoes-33 hectares with profit of 22477260]

Question 19 [Key factor with no sales mix]: Kumar Co. has two plants one at Sambalpur and the other at Bilaspur, where production of goods takes place. The basic raw material requirement is 80% of the finished product, by weight. Such materials are available locally, but are limited to 6000 MT at Rs. 1800 per MT at Sambalpur, and 16000 MT at Rs. 2000 per MT at Bilaspur. Any extra requirement will have to be procured from Jamshedpur at Rs. 2500 per MT. Other particulars are as under-

Particulars	For Sambalpur Unit	For Bilaspur Unit
CA. Parag Gupta	Ph.: +91 9891 432 632	Paraggupta_ca@yahoo.co.in
Costing & O.R.		
For notes/updates/amendments on all subjects log on: http://groups.yahoo.com/group/costingbyparaggupta		

Annual Output (MT)	12000	15000
Capacity Utilization	80%	60%
Other Variables (Rs. Lakhs)	156	192
Fixed Costs (Rs. Lakhs)	108	120

You are required to determine-

1. Cost break-up of each unit per MT of output.
2. Quantity of production at each unit of availability of local supplies of basic raw material only, by keeping the same total production of the Company, as a whole.
3. Cost savings, if any, as per revised schedule of production. (Nov.,2001)

[Ans.: Cost saving is Rs. 18.90 Lakhs]

The theory of constraints and throughput accounting

During the 1980s Goldratt and Cox (1989) advocated a new approach to production management called optimized production technology (OPT). OPT is based on the principle that profits are expanded by increasing the throughput **(throughput: sales –direct materials)** of the plant. The OPT approach determines what prevents throughput being higher by distinguishing between bottleneck and non-bottleneck resources. This approach advocates that bottleneck resources/activities should be fully utilized while non bottleneck resources/activities should not be utilized to 100% of their capacity since it would result in increase in inventory.

OPT is based on the principle that profits are expanded by increasing throughput of the plant i.e. rate at which raw material are turned into sales. The most widely recognized management accounting system developed for this purpose is known in USA as Theory of Constraints (TOC). The theory was picked up and inducted into an accounting system in the UK where it is known as Throughput Accounting (TA).

Instead of using marginal contribution to allocate resources to restricted resources, this theory uses the concept of throughput : sales – direct materials.

More importantly, the Theory of Constraints concludes that in many cases, resources should not be thrown heedlessly into production processes which are located before the bottleneck since this will only result in a build up of partially finished inventory waiting for processing which is more costly to accumulate than it is to underutilize the capacity. Traditional variance analysis focuses attention on underutilized capacity, e.g. unfavourable volume variances, which simply encourage plant managers to produce a backlog.

Basis of introducing TOC is to reduce inventory created by non-bottleneck machines in front of bottleneck machines.

The idea behind TOC is that raw materials is the only variable cost. Labour & variable overhead are consider as fixed cost.

The theory of constraints (TOC) describes methods to maximize operating income under bottleneck situation.

The three measurements:

1. Calculate Throughput contribution = sale - direct materials cost of the goods sold.
2. Investments(inventory) = Sum of materials costs in direct materials, work – in – process, and finished goods inventories; R & D costs; and costs of equipment and buildings.
3. Operating costs equal all costs of operations (other than direct materials) incurred to earn throughput contribution. Operating costs include salaries and wages, rent utilities, and depreciation.

The objective of TOC is to increase throughput contribution while decreasing investments and operating costs. TOC considers a short – run time and assumes that operating costs are fixed costs.

The important concept behind TOC is that the production rate of the entire factory is set at the pace of the bottleneck resource. Hence, in order to achieve the best result TOC emphasises the importance of removing bottlenecks (or limiting factor).

Procedure of TOC (Theory of Constraints)

Step-1: Find the total requirement of resources i.e. S of units × resource required per unit. Compute it for each department separately.

Step-2: Throughput accounting Ratio (TA ratio) = (Capacity required ÷ capacity available) ×100 for each department.

Step-3: The highest among the TA ratio will be considered as the bottleneck factor (Other scarce resources will be ignored).

Step-4: To obtain optimum use of the bottleneck activity we calculate contribution per bottleneck factor & rank accordingly.

Step-5: Prepare statement for optimum product mix for allocating the bottleneck factor.

Question 21: Explain the concept and aim of theory of constraints. What are the key measures of theory of constraints? (7 Marks) May/08

Question 22: A company produces three products A, B and C. The following information is available for a period:

	A	B	C	
Contribution (Rupees per unit) (Sales – Direct materials)	30	25	15	
Machine hours required per unit of production:				
	Hours			
	A	B	C	Throughout accounting ratio
Machine 1	10	2	4	133.33%
Machine 2	15	3	6	200%
Machine 3	5	1	2	66.67%

Estimated sales demand for A, B and C are 500 units each and machine capacity is limited to 6,000 hours for each machine.

You are required to analyse the above information and apply theory of constraints process to remove the constraints. How many units of each product will be made? (6 Marks) Nov/08-New Course

[Ans.: Units: A-100; B-500; C-500]

Question 23: A company produces 3 products A, B and C. The following information is available for a period.

	A	Production B	C
Contribution (Sales – Direct Materials)	Rs. 24	Rs. 20	Rs. 12
Machine hours required per unit:			
Machine 1	12	4	2
Machine 2	18	6	3
Machine 3	6	2	1
Estimated sales demand	200	200	200

It is given that machine capacity is limited to 3,200 hours for each machine, you are required to analyze the above information and apply TOC process to remove the constraint.

[Ans.: Units: A-77; B-200; C-200]

Question 24: Vikram Ltd. produces 4 products using 3 different machines. Machine capacity is limited to 3,000 hours for each machine. The following information is available for February, 2009:

Products	A	B	C	D
Contribution (Sales-direct material) Rs.	1,500	1,200	1,000	600
Machine Hours Required/Unit:				
Machine 1	10	6	2	1
Machine 2	10	9	3	1.5
Machine 3	10	3	1	0.5
Estimated Demand (units)	200	200	200	200

From the above information you are required to identify the bottleneck activity and allocate the machine time.

[Ans.: Units: A-200; B-11; C-200; D-200] (7 Marks) June/09-New Course

Budgeting Control And Performance Management

Budget is a financial and/or quantitative statement, prepared and approved prior to a defined period of time of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and employment of capital.

Features:

1. Financial and/or Quantitative statement
2. Futuristic – prepared and approved prior to a defined period of time
3. Goal Oriented – for the purpose of attaining a given objective
4. Components – income, expenditure and employment of capital

The objective of budgeting are:

1. To encourage self-study in all aspects of a company's operations.
2. To get all members of management to “put their heads” to the basic question of how the business should be run to make them a co-ordinated team operating in unison towards clearly defined objectives.
3. To force a definition and crystallization of company policies and aims.
4. To increase the effectiveness with which people and capital are employed.
5. To disclose areas of potential improvement in the company's operations.
6. To stimulate study of relationship of the company to its external economic environment for improving the effectiveness of its direction.

Budgetary Control:

Definition: Budgetary Control is defined as “the establishment of budgets, relating the responsibilities of executives to the requirement of a policy, and the continuous comparison of actual with budgeted results either to secure by individual action the objective of that policy or to provide a base for its revision.”

Salient features:

- a) **Objectives:** Determining the objectives to be achieved, over the budget period, and the policy or policies that might be adopted for the achievement of these ends.
- b) **Activities:** Determining the variety of activities that should be undertaken for the achievement of the objectives.
- c) **Plans:** Drawing up a plan or a scheme of operation in respect of each class of activity in physical as well as monetary terms for the full budget period and its parts.
- d) **Performance evaluation:** Laying out a system of comparison of actual performance by each person, section or department with the relevant budget and determination of causes for the discrepancies, if any.
- e) **Control Action:** Ensuring that corrective action will be taken where the plan is not being achieved and, if that be not possible, for the revision of the plan.

Objectives of budgetary control system

The objectives of a budgetary control system are:

1. **Definition of Goals:** Portraying with precision, the overall aims of the business and determining targets of performance for each section or department of the business.
2. **Defining responsibilities:** Laying down the responsibilities of each of the executives and other personnel so that everyone knows what is expected of him and how he will be judged.
3. **Basis for performance evaluation:** Providing basis for the comparison of actual performance with the predetermined targets and investigation of deviation, if any, of actual performance and expenses from the budgeted figures. It helps to take timely corrective measures.
4. **Optimum use of resources:** Ensuring the best use of all available resources to maximize profit or production, subject to the limiting factors.
5. **Coordination:** Co-ordinating the various activities of the business and centralizing control, but also facility for management to decentralise responsibility and delegate authority.
6. **Planned action:** Engendering a spirit of careful forethought, assessment of what is possible and an attempt at it. It leads to dynamism without recklessness. It also helps to draw up long range plans with a fair measure of accuracy.

7. **Basis for policy:** Providing a basis for revision of current and future policies. Providing a yardstick against which actual results can be compared.

Role of a Budget Officer:

- Successful implementation of budgetary control system depends upon the Budget Committee.
- The Budget Committee would be composed of all functional heads and a member from the Board to preside over and guide the deliberations.
- The Budget Committee acts through the Budget Officer whose responsibilities include:
 1. **Functional Budget preparation:** To assist in the preparation of the various budgets by coordinating the work of the accounts department which normally compiles the budgets, with the relevant functional departments like Sales, Production, Plant maintenance etc.
 2. **Communication to Responsible Centres:** To forward the budget to the individuals who are responsible to adhere to them and to guide them in overcoming any practical difficulties in its working.
 3. **Coordination:** To prepare the periodical budget reports for circulation to the individuals concerned, coordinating with them in the formulation of budgets for subsequent periods.
 4. **Follow-up:** To determine the follow-up action to be taken on the budget reports.
 5. **Budget Committee Review:** To prepare an overall budget working report for discussion at the Budget Committee meetings and to ensure follow-up on the lines of action suggested by the Committee.
 6. **Board Review:** To prepare periodical reports for the Board meeting, comparing the budgeted Profit and Loss Account and the Balance Sheet with the actual results.

Advantages of Budgetary Control System

1. **Efficiency:** It enables the management to conduct its business activities in an efficient manner. Effective utilization of scarce resources, i.e. men, material, machinery, methods and money – is made possible.
2. **Cost Control:** It is powerful instrument used by business houses for the control of their expenditure. It inculcates the feeling of cost consciousness among workers.
3. **Performance evaluation:** It provides a yardstick for measuring and evaluating the performance of individuals and their departments.
4. **Standard Costing and Variance analysis:** It creates suitable conditions for the implementation of standard costing system in a business organization. It reveals the deviations to management from the budgeted figures after making a comparison with actual figures.
5. **Policy formulation:** It helps in the review of current trends and framing of future policies.

Limitations of Budgetary Control System

1. **Estimates:** Budgets may or may not be true, as they are based on estimates. The assumptions about future events may or may not actually happen.
2. **Rigidity:** Budgets are considered as rigid document. Too much emphasis on budgets may affect day-to-day operations and ignores the dynamic state of organization functioning.
3. **False Sense of Security:** Mere budgeting cannot lead to profitability. Budgets cannot be executed automatically. It may create a false sense of security that everything has been taken care of in the budgets.
4. **Lack of coordination:** Staff co-operation is usually not available during budgetary control exercise.
5. **Time and Cost:** The introduction and implementation of the system may be expensive.

Flexible Budget:

Meaning: It is a budget, which is designed to change in relation to level of activity by recognizing the difference between fixed, semi-variable and variable costs.

Need: The need for preparation of flexible budgets arises in the following circumstances

- Seasonal fluctuations in sales and/or production, for example in soft drinks industry. Introduction of new products, product design and versions on a frequent basis.
- Industries engaged in make-to-order business like shipbuilding;
- An industry which is influenced by changes in fashion; and General change in sales

Flexible budgeting may be resorted to in the following situations:

- **New Business:** In the case of new business venture due to its typical nature it may be difficult to forecast the demand of a product accurately.
- **Uncertain Environment:** Where the business is dependent upon the mercy of nature e.g. a person dealing in wool trade may have enough market if temperature goes below the freezing point.
- **Factor market conditions:** In the case of labour intensive industry where the production of the concern is dependent upon the availability of labour.

Steps involved in the preparation of budgets

Definition of Objectives: Objectives should be defined precisely. They should be written out; areas of control de-marketed and items of revenue and expenditure to be covered by the budget stated. This will give a clear understanding of the plan and its scope to all those who must cooperate to make it a success.

Identification of key (or budget) factor: A key factor represents source whose availability is less than its requirement. Such resource constraints put a limit on the organization objective of maximum profitability. Some examples are lack of sales demand, rationing of raw material, labour shortage, plant capacity etc. For proper budgeting, the key factor must be located and estimated properly.

Budget Committee and Controller: Formulation of a budget usually requires whole time services of a senior executive; he must be assisted in this work by a Budget Committee, consisting of all the heads of department along with the Managing Director as the Chairman. The Controller is responsible for coordination and development of budget programmes and preparing the Budget Manual .

Budget Manual: The Budget manual is a schedule, document or booklet, which shows in a written form, the budgeting organization and procedure. The manual should be well written and indexed so that a copy thereof may be given to each department head for guidance.

Budget period: The period covered by a budget is known as budget period. Normally a calendar year or a period coterminous with the financial year is adopted as the Budget Period. It is then sub-divided into shorter periods – it may be months or quarters or such period as coincide with period of trading activity.

Standard of activity or output: The standards of activity levels for future period should be laid down. These are generally based on past statistics, known market changes and current conditions and forecast of future situations. In a progressive business, the achievement of a year must exceed those of earlier years. In budgeting, fixing the budget of sales and capital expenditure are most important since these budgets determine the extent of development activity.

ZERO BASE BUDGETING (ZBB):

Meaning: It is an expenditure control device where each divisional head has to justify the requirement of funds for each head of expenditure and prepare the budget accordingly, without reference to the past budget or achievements.

It is an operating planning and budgeting process, which requires each manager to justify his entire budget requests in detail from “scratch” (hence zero-base).

Features:

1. **Wholistic:** The technique deals practically with all the elements of budget proposals.
2. **Analytical:** A critical evaluation of all the ongoing activities is also done afresh together with new proposals. Each manager has to justify why he should spend any money at all.
3. **Priority Based:** This approach requires that all activities be identified as decision on packages, which would be evaluated by systematic analysis and ranked in order of importance.

4. **Review Based:** an organisation should not only make decisions about the proposed new-programmes but it should also from time to time, review the "utility" and "appropriateness" of the existing programmes.
5. **Rational:** It allows for budget reductions and expansions in a rational manner and allows re-allocation of resources from low to high priority programme.

Steps in Zero Base Budgeting (ZBB)

ZBB involves the following:

Objectives: Determination of a set of objectives is one of pre-requisite and essential step in the direction of ZBB technique.

Coverage: Deciding about the extent to which the technique of ZBB is to be applied, whether in all areas of organisation's activities or only in a few selected areas on trial basis.

Decision Areas : Identify those areas where decisions are required to be taken. Ranking: Developing decision – package and ranking them in order of preference. Budgeting: Preparation of budget, that is translating decision packages into practicable units items and allocating financial resources.

Advantages of ZBB:

The advantages of zero-base budgeting are as follows.

1. **Priority allocation:** It provides a systematic approach for the evaluation of different activities and ranks them in order of preference for the allocation of scarce resource.
2. **Maximum Efficiency:** It ensures that the various functions undertaken by the organization are critical for the achievement of its objectives and are being performed in the best possible way.
3. **Cost Benefit Analysis:** It provides an opportunity to the management to allocate resource for various cost benefit analysis. The chances of arbitrary cuts and enhancement are thus avoided.
4. **Elimination of wasteful expenditure:** The areas of wasteful expenditure can be easily identified and eliminated.
5. **Goal Congruence:** Department budgets are closely linked with corporate objectives.
6. **Management by Objectives:** The technique can also be used for the introduction and implementation of the system of 'management by objective' Thus it cannot only be used for fulfillment of the objectives of traditional budgeting but it can also be used for a variety of other purposes.

Limitations of ZBB:

1. **Lack of Coordination:** Various operational problems are likely to be faced in implementing the technique of ZBB. It requires the wholehearted support from top management.
2. **Old is Gold Attitude:** Generally managers are reluctant to start afresh. They tend to plan for future just by reference to past actions and budgets.
3. **Time Consuming:** It is time consuming as well as costly.
4. **Lack of trained staff:** It needs properly trained managerial personnel to do the required job.

Performance Budgeting: Meaning:

It is the process of analysing, identifying, simplifying and crystallizing specific performance objectives, of a job to be achieved over a period, within the framework of organizational objectives, the purposes and objectives of the job.

The technique is characterised by its specific direction towards the business objectives of the organization.

Features and Advantages:

- Performance budgeting lays immediate stress on the achievement of specific goals over a period of time.
- It aims at a continuous growth of the organisation so that it continues to meet the dynamic needs of its growing clientele.
- It enables the organization to be sensitive and adaptive, preventing it from developing rigidities, which may retard the process of growth.

- It requires the preparation of periodic performance reports, which compare budget and actual performance to find out existing variances.

Important considerations in Performance Reporting:

The important considerations in drawing up of reports and determining their scope are the following:

Significance	• Reliability – Are the facts in the report reliable? • Cause or Effect – Does it either call for action or demonstrate the effect of action
Timeliness	• Latest time – How late can the information be and still be of use? • Earliest Time – What is the earliest moment at which it could be used if it were available? • Frequency – How frequently is it required?
Accuracy	• How small should be an inaccuracy, which does not alter the significance of the information. • What doubtful elements does it contain? Could any of them or all together make a material difference?
Appropriateness	• Receiver – is the recipient the right person to take any action that is needed? • Additional Information – Is there any other information which is required to support the information to anyone else jointly interested?
Discrimination	• Will anything be lost by omitting the item? • Will any of the items gain from the omission? • Is the responsibility for suppressing the item acceptable?
Presentation	• Clarity – Is the report clear and unbiased? • Form – Is the form suitable to the subject and to the recipient?

Performance Reports:

A. Top Management: (including Board of Directors and financial managers)

- Balance Sheet
- Profit & Loss Statement
- Position of Stock;
- Disposition of funds or working capital
- Capital expenditure and forward commitments together with progress of projects in hand. Cash flow statements;
- Sales, production, and other appropriate statistics

B. Sales Management

- Actual sales compared with budgeted sales to measure performance by (a) products; (b) territories; (c) individual salesmen; and (d) customers.
- Standard profit and loss, product-wise (a) for fixing selling prices and (b) to concentrate on sales of most profitable products.
- Selling expenses in relation to budget and sales value analysed by (a) products; (b) territories; (c) individual salesmen; and (d) customers
- Bad debts and accounts, which are slow and difficult in collection. Status reports on new or doubtful customers.

C. Production management

- To Buyer:
Price variations on purchases analysed by commodities.
- To Foreman
Operational Efficiency for individual operators duly summarized as departmental averages. Labour utilization report and causes of lost time and controllable time; Indirect shop expenses against the standard allowed; and Scrap report
- To Works Manager
 1. Departmental operating statement

2. General works operating statements (Expenses relating to all works expenses not directly allocable or controllable by departments);
3. Plant utilization report;
4. Department scrap report; and
5. Material usage report

Special Reports: These are prepared at the request of general management or at the initiative of the management accountant. Some examples are :

- Taxation legislation and its effect on profits Estimates of the earning capacity of a new project Break-even analysis
- Capital budgeting decisions
- Special pricing analysis
- Make or buy certain components

Question 25: What are the advantages and limitations of Zero base Budgeting? (4 Marks) Nov./04

Question 26: "Because a single budget system is normally used to serve several purposes, there is a danger that they may conflict with each other". Do you agree? Discuss. (4 Marks) May/05

Ans.: A single budget system may be conflicting in planning and motivation, and planning and performance evaluation roles as below:

Planning and motivation roles – Demanding budgets that may not be achieved may be appropriate to motivate maximum performance but they are unsuitable for planning purposes. For these, a budget should be a set based on easier targets that are expected to be met.

Planning and performance evaluation roles - For planning purposes budgets are set in advance of the budget period based on an anticipated set of circumstances or environment. Performance evaluation should be based on a comparison of active performance with an adjusted budget to reflect the circumstance under which managers actually operated.

Question 27: Write short note on 'Zero Base Budgeting' as an approach towards productivity improvement.' (4 Marks) Nov./05

Question 28: Describe the process of zero-base budgeting. (4 Marks) May/07

Question 29: JBC Limited, a manufacturing company having a capacity of 60,000 units has prepared a following cost sheet:

Direct material per unit)	Rs. 12.50
Direct wages (per unit.)	Rs. 5.00
Semi-variable cost	Rs. 30,000 fixed plus 0.50 per unit
Factory overhead (per unit)	Rs. 10.00 (50% fixed)
Selling and administration overhead (per unit)	Rs. 8.00 (25% variable)
Selling price (per unit)	Rs. 40

During the year 2008, the sales volume achieved by the company was 50,000 units.

The company has launched an expansion program as under:

- (a) The capacity will be increased to 1,00,000 units.
- (b) The cost of investment on expansion is Rs. 5 lakhs which is proposed to be financed through financial institution at 12 per cent. per annum.
- (c) The depreciation rate on new investment is 10 per cent based on straight line.
- (d) The additional fixed overheads will amount to Rs. 2.00 lakhs up to 80,000 units and will increase by Rs. 80,000 more beyond 80,000 units.

After the expansion, the company has two alternatives for operating the expanded plant as under:

- (i) Sales can be increased up to 80,000 units by spending Rs. 50,000 on special advertisement campaign to explore new market.
- (ii) Sales can be increased up to 1,00,000 units subject to the following:
 - (a) Reduction of selling price by Rs. 4 per unit on all the units sold.
 - (b) The direct material cost would go down by 4 per cent due to discount on bulk buying.
 - (c) By increasing the variable selling and administration expenses by 4 per cent.

Required:

- (i) Construct a flexible budget at the level 50,000 units, 80,000 units and 1,00,000 units of production and select best profitable level of operation.

(ii) Calculate break even point both before and after expansion.

(9 Marks) Nov./08-Old Course

[Ans.: (i) Profit: 50000 units – Rs. 60000; 80000 units – Rs. 200000; 100000 units – Rs. 62000; (ii) BEP: Before Expansion: 50000 units – 46000 units; 80000 units – 66667 units; After expansion: 100000 units – 94570 units]

Question 30: The budgeted and actual cost data of M Ltd. for 6 months from April to September, 2008 are as under:

	Budget	Actual
Production units	16,000	14,000
Material cost	Rs. 25,60,000 (1,600 MT @ Rs. 1,600)	Rs. 41,60,000 (at Rs. 1,650)
Labour cost	Rs. 16,00,000 (at Rs. 40 per hour)	Rs. 15,99,840 (@ Rs. 44 per hour)
Variable overhead	Rs. 3,00,000	Rs. 2,76,000
Fixed overhead	Rs. 4,60,000	Rs. 5,80,000

In the first half of financial year 2009-10, production is budgeted for 30,000 units, material cost per tonne will increase from last year's actual by Rs. 150, but it is proposed to maintain the consumption efficiency of 2008 as budgeted. Labour efficiency will be lower by 1% and labour rate will be Rs. 44 per hour. Variable and fixed overheads will go up by 20% over 2008 actuals.

Prepare the Production Cost budget for the period April-September, 2009 giving all the workings.

[Ans.: Total cost Rs. 10261920]

(6 Marks) Nov./08-New Course

Question 31: A firm is engaged in the manufacture of two products 'A' and 'B'. Product A used one unit of component 'P' and two units of components 'Q'. Product B uses two units of component 'P', one unit of component 'Q' and two units of component 'R'. Component 'R' which is assembled in the factory uses one unit of component 'Q'. Components 'P' and 'Q' are purchased from the market.

The firm has prepared the following forecast of sales and inventory for the next year.

		Products	
		A	B
Sales	Units	8,000	15,000
Inventories:			
At the end of the year	Units	1,000	2,000
At the beginning of the year	Units	3,000	5,000

The production of both the products and the assembling of the component 'R' will be spread out uniformly throughout the year.

The firm at present orders its inventory of components 'P' and 'Q' in quantities equivalent to 3 months' consumption. The firm has been advised that savings in the provisioning of components can arise by changing over to the ordering quantities. The firm has compiled the following data relating to the two Components:

		P	Q
Price per unit	Rs.	2.00	0.80
Order placing costs per order	Rs.	15.00	15.00
Carrying costs p.a.		20%	20%

Required:

- Prepare a budget of production and requirements of components for the next year.
- Find the economic order quantity.
- Based on the economic order quantity calculated in (b) above, calculate the savings arising from switching over to the new ordering system both in terms of cost and reduction in working capital.

(May 1989)

Question 32: A Company is engaged in manufacturing two products 'X' and 'Y'. Product X uses one unit of component 'P' and two units of component 'Q'. Product 'Y' uses two units of component 'P', one unit of component 'Q' and two units of component 'R'. Component 'R' which is assembled in the factory uses one unit of component 'Q'.

Component 'P' and 'Q' are purchased from the market. The company has prepared the following forecast of sales and inventory for the next year:

	Product 'X'	Product 'Y'
Sales (in units)	80,000	1,50,000
At the end of the year	10,000	20,000
At the beginning of the year	30,000	50,000

The production of both the products and the assembling of the component 'R' will be spread out uniformly throughout the year. The company at present orders its inventory of 'P' and 'Q' in quantities equivalent to 3 months production. The company has compiled the following data related to two components:

	P	Q
Price per unit (Rs.)	20	8
Order placing cost per order (Rs.)	1,500	1,500
Carrying cost per annum	20%	20%

Required:

(a) Prepare a Budget of production and requirements of components during next year.

(b) Suggest the optimal order quantity of components 'P' and 'Q'. (11 Marks) May/06

[Ans.: (a) Production: X-60000 units, Y-120000 units; (b) P – 15000 components, Q – 30000 components]

Question 33: A Company manufactures two Products A and B by making use of two types of materials, viz., X and Y. Product A requires 10 units of X and 3 units of Y. Product B requires 5 units of X and 2 units of Y. The price of X is Rs. 2 per unit and that of Y is Rs. 3 per unit. Standard hours allowed per product are 4 and 3, respectively. Budgeted wages rate is Rs. 8 per hour. Overtime premium is 50% and is payable, if a worker works for more than 40 hours a week. There are 150 workers.

The Sales Manager has estimated the sales of Product A to be 5,000 units and Product B 10,000 units. The target productivity ratio (or efficiency ratio) for the productive hours worked by the direct worker in actually manufacturing the product is 80%, in addition, the non-productive downtime is budgeted at 20% of the productive hours worked. There are twelve 5-day weeks in the budget period and it is anticipated that sales and production will occur evenly throughout the whole period.

It is anticipated that stock at the beginning of the period will be:

Product A 800 units; Product B 1,680 units. The targeted closing stock expressed in terms of anticipated activity during the budget period are Product A 12 days sales; Product B 18 days sales. The opening and closing stock of raw material of X and Y will be maintained according to requirement of stock position for Product A and B.

You are required to prepare the following for the next period:

(i) Material usage and Material purchase budget in terms of quantities and values.

(ii) Production budget.

(iii) Wages budget for the direct workers.

(8 Marks) Nov./04

[Ans.: (i) Material usage Budget: Product A-65000 units, Product B-70000 units, Total cost of materials-Rs. 305000, Material Purchase Budget: X-108600 units at Rs. 217200; Y-38240 units at Rs. 114720 (ii) Production Budget: Product A – 5200 units, Product B – 11320 units (iii) Wages Budget: Total wages Rs. 697680]

Question 34: A manufacturer produces three products whose cost data are as follows:

		X	Y	Z
Direct materials (Rs. / Unit)		32.00	76.00	58.50
Direct Labour:				
Deptt.	Rate / hour (Rs.)	Hours	Hours	Hours
1	2.50	18	10	20
2	3.00	5	4	7
3	2.00	10	5	20

Variable overheads (Rs.)

8

4.50

10.50

Fixed overheads (Rs.) 4,00,000 per annum.

The budget was prepared at a time, when market was sluggish. The budgeted quantities and selling prices are as under:

Product	Budgeted quantity	Selling Price /
	(Units)	(Rs.)
X	19,500	135
Y	15,600	140
Z	15,600	200

Later, the market improved and the sales quantities could be increased by 20 per cent for product X and 25 per cent each for product Y and Z. The sales manager confirmed that the increased sales could be achieved at the prices originally budgeted. The production manager stated that the output could not be increased beyond the budgeted level due to the limitation of Direct labour hours in department 2.

Required:

- (i) Prepare a statement of budgeted profitability.
- (ii) Set optimal product mix and calculate the optimal profit.

(14 Marks) Nov./07

[Ans.: (i) Profit Rs. 399500 (ii) X 19500 units, Y 23400 units, Z 10585 units; optimal profit Rs. 406450]

Transfer Pricing

A transfer price is the amount of money that one subunit (segment, department, division and so on) of an organization charges for goods and services to another subunit of an organization.

The transfer price creates revenue for the selling subunit and purchase cost for the buying subunit, affecting each subunit's operating income. The product transferred between subunits of an organization is called an **intermediate product**. It can either be processed further by receiving subunit or, if transferred from production to marketing, resold to an external customer.

Organizations have a system of transfer pricing, therefore, in order to assess the efficiency and effectiveness of its department and divisional managers. This may be in spite of the fact that transfer prices may be artificial in the sense that it is felt that there is no rationale for "selling" between departments and divisions.

Aims of a transfer pricing system

- ☐ To **encourage goal congruence**, whereby individual managers' own goals are the same as the goals of the company as a whole.
 - ☐ To enable the **realistic measurement of divisional profit**.
 - ☐ To sustain high level of **management efforts**.
 - ☐ To give **autonomy** to managers.
 - ☐ To ensure **profit maximisation** for the company as a whole.
- It may be difficult to reconcile all of these aims.

Responsibility Accounting. Each manager, regardless of level, is in charge of a responsibility center. A responsibility center is a segment of an organization whose manager is accountable for a specified set of activities. The higher the manager's level, the broader the responsibility center and generally, the larger the no. of his subordinates. Responsibility Accounting is a system that measures the plans (by budgets) and actions (by actual results) of each responsibility center. Responsibility accounting is concerned with designing reports that help motivate managers to make decisions and to take actions that are in the best interests of the overall organization. Four major types of responsibility centers are:

- Cost Center - the manager is accountable for costs only. E.g. Maintenance Manager
- Revenue Center - the manager is accountable for revenues only. E.g. Sales Manager
- Profit Center - the manager is accountable for revenues & costs. E.g. Department/Segmental Manager
- Investment Center - the manager is accountable for investments, revenues & costs. E.g. Regional Manager responsible for investment in new projects and for revenues & costs.

Transfer Pricing Methods

Market-based transfer prices. When there is a competitive outside market for the good or service transferred between the divisions, the market price is often used as a transfer price. This solution is reasonably easy to administer and provides a theoretically correct transfer price when there is no idle capacity. However, when there is idle capacity in the selling division, the transfer price will be too high and the buying division may inappropriately purchase from an outside supplier or cut back on volume.

The major merits of this method are:

- a) **Maximum Prices:** In a competitive market, goods/services cannot be transferred to its users at a higher price. Hence market prices constitute the basis for efficient production.
- b) **Demand and Supply Forces:** Market prices take into account, the forces of demand and supply. If intermediate products are freely saleable, in the long run, market prices will provide a good indicator of the overall efficiency of the various divisions.
- c) **Opportunity Cost Recovery:** Opportunity costs of transferring divisions are fully recovered. Hence there is sufficient incentive for internal transfer, for transferring divisions operating at full capacity.
- d) **Objective:** Market prices provide reliable measures of divisional income because these prices are established independently rather than by individuals who have an interest in the results.

The major demerits of this method are:

- a) **Availability of Market Prices:** There may be difficulty in obtaining just / fair market prices.

Sometimes, the intermediate product may not be saleable; in other cases direct market substitutes may not be available for products, which are manufactured only for internal consumption.

- b) **Impact of S&D Costs:** There may be difficulties in determining the elements of Selling and Distribution costs such as commission, discounts, advertisement and sales promotion etc. so that necessary adjustment may be made in the market price to provide benefit of these expenses, to the recipient Division.
- c) **Unjust Enrichment:** Market Prices lead to unjust enrichment of the transferring division, particularly if the former has sufficient spare capacity and the intermediate is not freely saleable externally.

Negotiated transfer prices (a.k.a. Shadow Pricing). It refers to the determination of transfer prices based on active participation, involvement, co-ordination and agreement of the managers of the transferring and recipient division. In principle, if division managers understand their own businesses and are cooperative, negotiated transfer prices should work quite well. It is always possible in such a situation (barring externalities) to find a transfer price that would increase each participating division's profits. While negotiated transfer prices can work quite well under the right conditions, if managers are uncooperative and highly competitive, negotiations may go nowhere.

Advantages:

1. **Proper Decision Making:** Negotiated prices lead to business like attitude amongst divisions of the company. The buying division may purchase from outside sources if the outside prices are lower than the internal division's price.
2. **Autonomy and Motivation Value:** Each sub-unit is considered as an independent unit. Buyers and Sellers are completely free to deal outside the Company. This promotes sub-unit autonomy and motivates managers.
3. **Overall Company Profitability:** Through properly direct negotiations, managers will be able to determine the appropriate transfer prices that satisfy the requirements of the divisions and is in the best interest of the Company as a whole.

Limitations:

1. **Sub-optimal:** The agreed transfer price may depend on the negotiating skills and bargaining powers of the managers involved. The final result may not always be optimal.
2. **Conflicts:** Rather than agreement on transfer prices, negotiations can lead to conflict between divisions and may require top-management mediation.
3. **Defeat of Performance evaluation criteria:** Transfer prices dependent on manager's negotiation skills will defeat the very purpose of performance evaluation.
4. **Time and Cost:** Negotiations are time consuming for the manager involved, particularly when the number of transactions and interdependencies are large.

In order to have an effective system of transfer pricing; the following points should be kept in view;

- Price of all transfer in and out of a profit centre should be determined by negotiation between the buyer and the seller.
- Negotiations should have access to full data on alternative source and markets and to public and private information about market prices.
- Buyers and sellers should be completely free to deal outside the company.

Cost-based transfer prices. Transfer Price can be recorded at:

(i) Variable costs (ii) Full manufacturing cost (iii) Total Actual cost (iv) Standard Cost or at (v) Variable or Full cost plus some arbitrary mark-up.

- **Variable Manufacturing Costs:**

Merits	Demerits
• Simple to understand. • Easy To Operate • No Negative Contribution to Transferring Division • Suitable if Transferring Division has sufficient spare capacity and intermediate product is not marketable.	• Cost and Prices fluctuate from time to time, Hence Transfer prices also vary. • No Contribution from transferring division, since only manufacturing cost is recouped. • Not suitable for performance evaluation. • Does not consider opportunity costs and losses.

	Not suitable for transferring divisions which operate at full capacity.
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• **Full Manufacturing Cost:**

Merits	Demerits
- Simple to understand. - Easy to Operate. - Guaranteed Contribution to transferring division, to the extent of fixed manufacturing cost. - Ideal if transferring division has sufficient spare capacity, and intermediate product is not marketable.	- Cost and Prices fluctuate from time to time, Hence Transfer prices also vary. - Not suitable for performance evaluation. - Does not consider opportunity costs and losses. - Not suitable for transferring divisions which operate at full capacity.

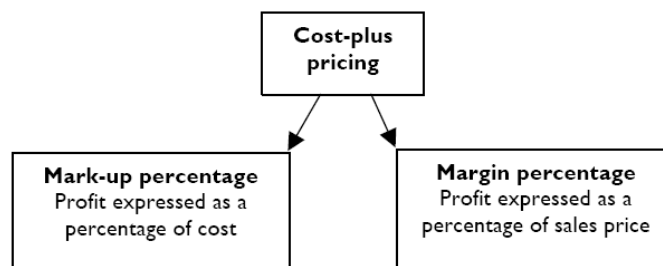
• **Total Actual Costs:**

Merits	Demerits
- Simple to understand. - Easy to Operate. - Guaranteed Contribution to transferring division, to the extent of fixed cost. Usable if transferring division has sufficient spare capacity, and intermediate product is not marketable.	- Actual Cost and Prices fluctuate from time to time, - Not suitable for performance evaluation of transferring division. - Does not Consider Opportunity costs and losses. - Not suitable for transferring divisions which operate at full capacity. - Cost efficiency of transferring division may mean lower prices, hence no incentive for cost reduction.

• **Standard Costs:**

Merits	Demerits
- Simple and Easy to operate when compared with actual cost based methods. - Inventories are carried at standard costs in transferring and receiving divisions.	- The Transferring divisions usually absorb variances and hence segment-wise performance evaluation is not possible. - Does not Consider Opportunity costs and losses.

- **Cost Plus mark-up:** Under this method, the transfers are made at Cost + Mark-up basis. Cost may be any variant i.e. Variable Manufacturing Costs or Full Manufacturing Costs or Total Cost (Actual) or Standard Costs.
Mark-up added to cost may be expressed either (1) as a percentage of full cost or (2) as a percentage of capital employed.



Total Actual cost of the product includes all production costs plus cost from other business functions (R & D, design, marketing, distribution and customer service).

Dual Pricing: The dual pricing method uses two prices. The supplying division is credited with a price based on total cost plus a mark-up and the receiving division is debited with marginal cost. This means that the selling division is allowed to earn a profit and the receiving division has the correct information in order to make the correct selling decision to maximize the group's profit. The difference between the two prices will be debited to a group account- a transfer price adjustment account. At the end of the year the profits of the two divisions, and hence of the group, will be overstated to the extent of the price difference. In order to correct this, the total amount in the transfer price adjustment account must be subtracted from the two profits to arrive at the correct profit for the group as a whole.

Dual pricing can also be used with market price in place of marginal cost for the receiving division. This can aid the supplying division in a particular circumstance. For example, where market prices are very volatile and the market price of the component suddenly collapses it may be unrealistic to expect the supplying division to cope with the decreases. Under the circumstances the receiving division would wish to buy elsewhere if the transfer price set was higher than the market price. So the supplying division could be credited with total cost plus and the receiving division debited with the much reduced market price. The receiving division would then be happy to continue to buy internally.

The dual pricing method can be effective in avoiding sub-optimal decisions but it can be administratively cumbersome.

Advantages:

1. **Incentive to Transferring Division:** The transfer price will meet the performance evaluation requirements of the transferring division since each unit transferred generates a profit (due to mark-up). Thus the supplying division manager is motivated to transfer the intermediate product internally.
2. **No unjust Enrichment:** If the transfer price is set at the transferring division's marginal cost of the intermediate product, it will not have any contribution from the internal transfers. All the total contribution from inter-divisional trading will be assigned to the Recipient division. Such unjust enrichment is avoided through the use of mark-up.
3. **Optimal Decisions:** Since relevant cost analysis is used as the second transfer price, the transfer pricing system automatically promotes goal congruence by leading to optimal decisions.

Disadvantages:

1. **Confusing:** The use of different transfer prices causes confusion, particularly when more than two divisions are involved.
2. **Artificial:** Dual Transfer Prices are considered to be artificial.
3. **No incentive:** Fixed price with mark-up protects transferring divisions from competition. It reduces divisional incentives to compete effectively and give them little incentive to improve their productivity.
4. **Misleading:** Dual Transfer prices can result in misleading information and create a false impression of divisional profits. There is a possibility of double-counting of profits. At the extreme, all divisions may report profits when the company as a whole is losing money.

Two-part transfer pricing: To avoid the sub-optimal decisions that may occur when the fixed costs of one division are perceived as variable costs by another division, a two part transfer price might be used.

Under this method, Transfer price = Marginal Cost + **Lump-sum** Fixed Fee

- This method is most suited when there is no market for the intermediate product, and the transferring division has no capacity constraints.
- The Transferring Division is provided with sufficient incentive for internal transfer, since marginal costs are fully recovered and the lump-sum fee received will reduce its losses by recovering fixed costs.
- The Recipient Division is also interested in the internal procurement since the transfer price will be less than market price or cost of alternative option like outsourcing etc.
- This system also has a drawback the supplying division has no incentive to supply units swiftly, as each unit does not generate a profit. The profit is made whenever the fixed fee is transferred.

Moreover, the lump-sum fixed fee constitutes a commitment if the divisions to utilize a portion of the capacity of the transferring divisions, for an agreed compensation.

General guidelines for setting Transfer Prices:

Minimum Transfer Price: The selling division would like for the transfer price to be as high as possible. The manager of selling division will not agree to a transfer price that is less than his or her "cost." But what cost? If

the manager is rational, then the manager should realize that any transfer price that covers variable cost plus fixed costs specific to such decision plus opportunity cost will result in an increase in segment profits. The opportunity cost is the contribution margin that is lost on units that cannot be produced and sold as a result of the transfer. Therefore, the lowest acceptable transfer price as far as the selling division is concerned is: When there is idle capacity, there are no lost sales and so the total contribution margin of lost sales is zero.

$$\text{Transfer Price} \geq \text{Incremental Costs (i.e. Variable cost + Specific Fixed costs to such decision)} + \frac{\text{Total contribution margin of lost sales}}{\text{Total number of units transferred}}$$

Also Packaging Cost, Bad Debts, Selling & Distribution costs are not included (except specifically mentioned).

Maximum Transfer Price: The buying division clearly would not voluntarily agree to a transfer price (subject to his ability to pay) unless:

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier (i.e. Market Price plus buying cost incurred)}$$

Domestic Transfer Pricing recommendations

- 1) Where a competitive market exists for intermediate products & there is *no* idle capacity, the market price (less adjustments for selling and distribution, packaging cost, bad debts, & collection expense to outside customers) should be used as transfer price.
- 2) Where a competitive market exists for intermediate products & there is idle capacity, variable cost should be transfer price.
- 3) Where no external market exists for the intermediate product, transfers should be made at two-part transfer pricing basis.
- 4) Where an imperfect market for intermediate product and a *small no. of products, transactions are involved*, a negotiated transfer pricing is most suitable method.
- 5) Where a cost-based transfer prices are used standard costs, and not the actual costs, per unit of output should be used. If actual costs are used the selling division will be able to pass on the cost of any inefficiency to the buying division. Using standard costs ensures that costs of inefficiencies are borne by the selling division.

Multinational Transfer Pricing and Maximization of income through transfer pricing mechanism :

Transfer Pricing Policies of domestic companies forecast on "Goal Congruence" and "Motivation". In Multinational companies other factors may dominate, e.g.; Transfer Prices are used to minimize world wide "Income Tax" and "Import Duties".

Many organizations have divisions located in different countries. Deciding on a set of transfer prices to use for exchange between these divisions requires consideration of additional factors. These factors are -

- 1) Income Tax Rates: Items produced by divisions in a low Income tax rate country may be transferred to a division of a high Income tax Rate country at a high transfer price to minimize taxes.
- 2) Import Duties: Sometimes Income tax effect is offset by Import Duty. Products may be transferred into high duty countries at an artificially low transfer price so that, assuming duty is charged *ad valorem*, the duty paid will be low.
- 3) Income repatriation: Some countries restrict the repatriation of incomes or dividends. By increasing the price of goods or services transferred into divisions in these countries, firms can increase the funds repatriated out of these countries without violating income or dividend, restriction.
- 4) Inflation: It is possible to avoid an accumulation of fund in a country from which high inflation rates or where an early devaluation is thought to be a probability.
- 5) Penetrating a new market: Transfer prices may be set low for an affiliate that is trying to establish a competitive advantage over a local company.

Question 1: In transfer pricing what is common conflict between a division and the company as a whole.

OR

(6 Marks) May/97

"Transfer pricing is a widely debated and contested topic" – Discuss

(5Marks) Nov./99

Ans.: Usually a conflict between a division of the company and the company as a whole is faced by the management of decentralized units when products or services are exchanged among different divisions of the company. Such a conflict becomes more significant in the case of those concerns where profitability is used as criteria for evaluating the performance of each division.

The essence of decentralisation is reflected in the freedom to make decisions. Under such set up it is expected that the top management should not interfere with the decision making process of its subordinates heading different units. In other words, management of decentralized units is given autonomy with regard to decision-making. In this system top management is expected to preserve 'autonomy in decision making'. The management of such companies also expects that each division should not only achieve its own objective necessary for evaluating the performance but should also achieve the objective of goal congruence.

A divisional head in a company under aforesaid set up is free to use a price as a transfer price for goods and services, which may provide incentive. Such a transfer price may fail to achieve the objective of 'Goal congruence' (which means a perfect congruence between division's goal and the goal of the company). In case of failure of a division to achieve the objective of 'goal congruence' the management of the company may 'dictate their 'transfer price'. Such an interference of management of the company is usually the main basis of conflict between a division and the company as a whole.

Further this conflict is aggravated if the management advocates the transfer of goods and services at cost. As such the transfer price will not reflect a good picture about the performance of the transferring division. The profitability of the transferring division will not be known by the use of such a transfer price.

Each division appreciates the transfer of its goods/services at usual selling price/market price so as to arrive at the correct return/profitability figure, used for measuring the performance. There is no incentive to the transferring division if goods and services are transferred at variable cost.

Question 2: Enumerate and briefly explain any three methods of determining transfer price.

(6 Marks) May/98

Question 3: What should be the basis of transfer pricing, if unit variable cost and unit selling price are not constant?

(4 Marks) Nov./99

Ans.: If unit variable cost and unit selling price were not constant then the main problem that would arise while fixing the transfer price of a product would be as follows:

There is an optimum level of output for a firm as a whole. This is so because there is a certain level of output beyond which its net revenue will not rise. The ideal transfer price under these circumstances will be that which will motivate these managers to produce at this level of output.

Essentially, it means that some division in a business house might have to produce its output at a level less than its full capacity and in all such cases a transfer price may be imposed centrally.

Question 4: What will be the marketable transfer pricing procedure regarding the goods transferred under the following conditions (each condition is independent of the other)?

(i) When division are not captives of internal divisions and the divisions are free to do business both internally and externally and when there are reasonably competitive external markets for the transferred products.

(ii) If the external market for the transferred good is not reasonably competitive. (3 Marks) Nov./00

b) Discuss the potential for maximization of income by a multinational through the use of transfer pricing mechanism. (3 Marks) Nov./00

Question 5: Indicate the possible disadvantages of treating divisions as profit centres. (4 Marks) Nov./01

Ans.: The Possible disadvantages of treating divisions as profit centres are as follows:

Divisions may compete with each other and may take decisions to increase profits at the expense of other divisions thereby overemphasizing short term results.

It may adversely affect co-operation between the divisions and lead to lack of harmony in achieving organizational goals of the company. Thus it is hard to achieve the objective of goal congruence.

It may lead to reduction in the company's overall total profits.

The cost of activities, which are common to all divisions, may be greater for decentralized structure than centralized structure. It may thus result in duplication of staff activities.

Top management loses control by delegating decision making to divisional managers. There are risks of mistakes committed by the divisional managers, which the top management, may avoid.

Series of control reports prepared for several departments may not be effective from the point of view of top management.

It may under utilize corporate competence.

It leads to complications associated with transfer pricing problems.

It becomes difficult to identify and define precisely suitable profit centres.

It confuses division's results with manager's performance.

Question 6: What are some goals of a 'transfer-pricing' system in an organization?

(4 Marks) May/06

Question 7: Briefly describe the different methods of Transfer Pricing.

(4 Marks) Nov./05

Question 8: PH Ltd., has two manufacturing departments organized into separate profit centers known as the Basic unit and processing unit. The Basic unit has a production capacity of 4,000 tonnes per month of chem wax but at present its sales are limited to 2,000 tonnes to outside market and 1,200 tonnes to the processing unit.

The transfer price for the year 2003 was agreed at Rs.400 per tonne. This price has been fixed in line with the external wholesale trade price on 1st January, 2003. However, due to heavy competition the basic unit has been forced to reduce the wholesale trade price to Rs.360 per tonne with effect from 1st June, 2004. This price, however, was not made applicable to the sales made to the processing unit of the company. The processing unit applied for revision of the price as applicable to the outside market buyers as from 1st June, 2004 but the same was turned down by the basic unit.

The processing unit refines chem. wax and packs the output known as colour-X in drums of 50 kg. each. The selling price of colour-X is Rs.40 per drum. The processing unit has a potential of selling a further quantity of 16,000 drums of colour-X provided the overall price is reduced to Rs.32 per drum. In that event it can buy the additional 800 tonnes of chem wax from the basic unit whose capacity can be fully utilized. The outside market will not however absorb more than the present quantity of 2,000 tonnes.

The cost data relevant to the operation are:

Particulars	Basic unit Rs.	Processing unit Rs.
Raw Material / tonne	70	Transfer Prices
Variable costs / tonne	140	170
Fixed costs	3,00,000	1,20,000

Required:

- Prepare statements showing the estimated profitability for June, 2004 for each unit and the company as a whole on the following basis:
 - At 80% and 100% capacity utilization of the basic unit at a market price and transfer price to the processing unit of Rs.400 per tonne.
 - At 80% capacity utilization of the basic unit at the market price of Rs.360 per tonne and the transfer price to the processing units of Rs.400 per tonne.
 - At 100% capacity utilization of the basic unit at the market price and transfer price to the processing unit of Rs.360 per tonne.
- Comment on the effect of the company's transfer pricing policy on the profitability of the processing unit.

[Ans.: (i) (a) At 80% Rs. 464000 At 100% Rs. 480000 (b) Rs. 384000 (c) Rs. 400000]

Question 9: Tycon Ltd. has two manufacturing departments organised into separate profit centres known as Textile unit and Process House. The Textile unit has a production capacity of 5 lacs metres cloth per month, but at present its sales is limited to 50% to outside market and 30% to process house.

The transfer price for the year 2004 was agreed at Rs.6 per metre. This price has been fixed in line with the external wholesale trade price on 1st January, 2004. However, the price of yarn declined, which was the raw material of textile unit, with effect, that wholesale trade price reduced to Rs. 5.60 per metre with effect from 1st June, 2004. This price was however not made applicable to the sales made to the processing house of the company. The textile unit turned down the processing house request for revision of price.

The Process house refines the cloth and packs the output known as brand Rayon in bundles of 100 metres each. The selling price of the Rayon is Rs. 825 per bundle. The process house has a potential of selling a further quantity of 1,000 bundles of Rayon provided the overall prices is reduced to Rs. 725 per bundle. In that event it can buy the additional 1,00,000 metres of cloth from textile unit, whose capacity can be fully utilised.

The outside market has no further scope.

The cost data relevant to the operations are:

	Textile unit Rs.	Process house Rs.
Raw Material (per meter) on 1 st June 2004	3.00	Transfer Price
Variable Cost	1.20 (per metre)	80 (per bundle)
Fixed Cost (per month)	412000	100000

You are required to:

- Prepare statement showing the estimated profitability for June, 2004 for Textile unit and Process house and company as a whole on the following basis:

- (a) At 80% and 100% capacity utilisation of the Textile unit at the market price and the transfer price to the Processing house of Rs. 6 per metre.
 (b) At 80% capacity utilisation of the Textile unit at the market price of Rs. 5.60 per meter and the transfer price to the Processing house of Rs. 6 per meter.
 (c) At 100% capacity utilisation of the Textile unit at the market price of Rs. 5.60 per metre and the transfer price to the Processing house of Rs. 5.60 per metre.

(ii) Comment on the effect of the company's transfer pricing policy on the profitability of Processing house.

[Ans.: (i) 800 units should be sold as sale of intermediary and 200 units should be transferred to B (ii) Rs. 1350, (iii) Full quantity should be sold outside as intermediary.] (11 Marks) Nov/04

Question 10: Vivek Ltd., has two manufacturing divisions AD and CD. Each division operates as an independent profit centre.

AD which produces two components BRITE and LITE has a capacity of 1,00,000 hours per annum. The annual fixed overheads of this department amounts to Rs.20 lacs. The product wise variable cost data are as under:

Particulars	Brite	Lite
Direct materials	10	5
Direct labour and variable overheads	140	35
Total	150	40

The direct labour and variable overhead rate is Rs.35 per hour.

AD has a permanent customer for the purchase of 15,000 units of BRITE per annum at a selling price of Rs.300 per unit. The balance capacity is devoted to the production of LITE for which there is an unlimited sales potential at Rs.60 per unit.

CD assembles a product known TITE by using an imported component. The annual fixed overheads of this division amount to Rs.4 lakhs and the variable cost date per unit are as under:

	TITE Rs/Unit
Imported component	300
Direct materials	40
Direct labour and variable overheads (10 hours @ Rs.25)	250
Total	590

The selling price of TITE is Rs.700 per unit.

With a view to minimizing the dependence on imported components, the possibility of using the company's own component BRITE, which is similar to the imported component, was explored. The import substitution is possible with slight modification in the manufacture of TITE which in that case will take two extra labour hours per unit. This means an increase of Rs.50 in variable costs per unit of TITE. CD envisages a production of 5,000 units per annum of TITE. You are required to present the division wise profitability and the profitability of the company as a whole on the basis of the following conditions:

- CD imports its requirement of 5,000 components for the manufacture of TITE.
- CD stops import and substitutes BRITE by drawing 5,000 units of BRITE from AD at the market price of Rs.300 per unit.
- Same situation as in (ii) above except that CD gets a relief of Rs.50 per unit (net transfer price to CD is Rs.250 per unit) of BRITE to compensate the increased labour and variable overhead cost of CD.
- CD revises its production programme to manufacture 12,000 units of TITE by drawing 10,000 units of BRITE from AD at Rs.250 per unit and import the balance of 2,000 units of components at Rs.300 per unit. Due to installation of additional production capacity, the annual fixed overhead of CD would increase by Rs. 7,70,000 In order to induce CD to the expansion programme, do you think a negotiated transfer price of Rs. 240 for BRITE would be agreed by AD? Give reasons and also comment on the best alternative (i) to (iv) for the company as a whole.

[Ans.: Profit of Co. in Alt I: Rs. 1200000; Alt II:1300000; Alt III: 1300000; Alt IV: 1400000]

Question 11: Bearings Ltd. makes three products, A, B and C in Divisions A, B and C respectively. The following information is given :

	A	B	C	
Direct Materials (excluding material A for Divisions B and C)	4	15	20	Rs./u
Direct labour	2	3	4	Rs./u
Variable overhead	1	1	1	Rs./u
Selling price to outside customers	15	40	50	Rs./u
Existing Capacity	5,000	2,500	2,500	(No. of units)

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Maximum External demand	3,750	5,000	4,000	(No. of units)
Additional fixed costs that would be incurred to install additional capacity	24,000	6,000	18,750	Rs.
Maximum Additional units that can be produced by additional capacity	5,000	1,250	2,250	(No. of units)

B and C need material A as their input. Material A is available outside at Rs. 15 per unit. Division A supplies the material free from defects. Each unit of B and C requires one unit of A as the input material.

If B purchases from outside, it has to pay Rs. 15 per unit. If B purchases from A, it has to incur in addition to the transfer price, Rs. 2 per unit as variable cost to modify it.

B has sufficient idle capacity to inspect its inputs without additional costs.

If C gets material from A, it can use it directly, but if it gets material from outside, which is at Rs. 15, it has to do one of the following :

(i) Inspect it at its own shop Boor at Rs. 3 per unit.

Or

(ii) Get the supplier to supply inspected products and pay the supplier Rs. 2 p.u. as inspection charges.

Or

(iii) A has enough idle labour, which it can lend to C to inspect at Re. 1 p.u. even though C purchases from outside.

A has to fix a uniform transfer price for both B and C. The transfer price will not be known to outsiders and is at the discretion of the Divisional Managers.

What is the best strategy for each division and the company as a whole? (12 Marks) June/09 [New Course]

[Ans.:

Question 12:

	<i>Division A</i> Rs. per unit	<i>Division B</i> Rs. per unit
Variable cost	10	15
Transfer price at market value	—	20
Fixed costs	5	10
Profit	5	25
Transfer price/selling price	20	70

Division A can sell externally at Rs.20 per unit or transfer internally to Division B at Rs.20 per unit.

Division B receives an offer from a customer of Rs. 30 per unit for its final product.

Requirements

- Would Division B accept the offer of Rs. 30 per unit given the existing transfer price?
- Is this the correct decision from the company's point of view
 - Division A has surplus capacity?
 - Division A is operating at full capacity?

Give proper explanations.

[Ans.: (a) No, there is a negative contribution of Rs. 5 per unit. (b) (i) No, co. could earn a contribution of Rs. 5 per unit. (b) (ii) Yes, there is a negative contribution of Rs. 5 per unit, There would be goal congruence and the manager of division B would not make a sub-optimal decision.]

Question 13: AB Cycles Ltd. has 2 divisions, A and B which manufacture bicycle. Division A produces bicycle frame and Division B assembles rest of the bicycle on the frame. There is a market for sub-assembly and the final product. Each division has been treated as a profit centre. The transfer price has been set at the long-run average market price. The following data are available to each division:

Estimated selling price of final product	Rs. 3,000 p.u.
Long run average market price of sub-assembly	Rs. 2,000 p.u.
Incremental cost of completing sub-assembly in division B	Rs. 1,500 p.u.
Incremental cost in Division A	Rs. 1,200 p.u.

Required:

(i) If Division A's maximum capacity is 1,000 p.m. and sales to the intermediate are now 800 units, should 200 units be transferred to B on long-term average price basis.

(ii) What would be the transfer price, if manager of Division B should be kept motivated?

(iii) If outside market increases to 1,000 units, should Division A continue to transfer 200 units to Division B or sell entire production to outside market? (9 Marks) May/05

[Ans.: (i) 800 units should be sold as sale of intermediary and 200 units should be transferred to B (ii) Rs. 1350; (iii) Full quantity should be sold outside as intermediary]

Question 14: A large business consultancy firm is organized in to several divisions. One of the divisions is the Information Technology (IT) division which provides consultancy services to its clients as well as to the other divisions of the firm. The consultants in the IT division always works in a team of three professional consultants on each day consulting assignment. The external are to be charged a fee at the rate of Rs. 4500 for each consulting day. The fee represents the cost plus 150% profit mark up. The break up of the cost involved in the consultancy fee is estimated at 80% as being variable and balance is being fixed.

The textile division of the consultancy firm which has undertaken a big assignment requires the services of two teams of IT consultants to work five days in a week for a period of 48 weeks. While the director of the textile division intends to negotiate the transfer price for the consultancy work, the director of IT division proposed to charge the textile division at Rs. 4500 per consultancy day.

In respect of the consultancy work of the textiles division, IT division will be able to reduce the variable cost by Rs. 200 per consultancy day. This is possible in all cases of internal consultations because of the use of specialized equipment.

You are required to explain the implication and set transfer prices per consulting day at which the IT division can provide consultancy services to the textiles division such that the profit of the business consultancy firm as a whole is maximized in each of the following scenarios:

- (i) Every team of the IT division is fully engaged during the 48 week period in providing consultancy services to external clients and that the IT division has no spare capacity of consultancy teams to take up the textiles division assignment.
- (ii) IT division will be able to spare only one team of consultants to provide services to the textile division during the 48 week period and all other teams are fully engaged in providing services to external clients.
- (iii) A new external client has come forward to pay IT division a total fee of Rs. 1584000 for engaging the services of two teams of consultants during the aforesaid period of 48 weeks.

[Ans.: (i) Rs. 4300 for each consulting day; (ii) Rs. 4300 for each consulting day for 1st team & Rs. 1240 for each consulting day for 2nd team i.e. Rs. 2770 (average of 4300 & 1240) (iii) Transfer Price should be Rs. 3100 (3300-200) per consulting day] (11 Marks) Nov/08-Old Course

Question 15: A large public sector company has several manufacturing divisions. Two of these are AJ and DJ each of which sells most its output to customers outside the group divisions. AJ division operates at full capacity. It can in other words expand its production capacity only at an extra cost. DJ on the other hand operates at present 50% capacity.

DJ is actively seeking profitable ways to utilize its idle capacity, The management of DJ has been able to secure an order for 2,000 units of its product 'M' to be delivered over a period of a year at a price of Rs.105 each. DJ can meet this deliver schedule easily and the estimated breakup of cost of this item per unit is as under. (Rs.)

Components purchased from outside Market	45
Part No.35 purchased from AJ	10
Factory variable overheads costs	28
Selling overheads variable	16
Total Cost per unit	99

Besides this, the interest charges an additional capital required for manufacture of this product will amount to Rs.1,000 p.a.

DJ expects that part No.35 will be supplied by AJ. This part which is being manufactured by AJ is being sold to outside customers at Rs.15 each and AJ has a market for 20,000 units of this part at this price. Even the production in excess of this quantity can be sold by AJ to the outside customers at this price. The variable cost of part 35 to AJ is Rs.8.50 each.

DJ on the other hand would be able to procure part 35 from outside suppliers at Rs.15 each, being the same price at which AJ sells to outside. Since the payment of market price for part 35 will wipe off the profit, DJ has asked the Chief Executive of AJ to supply the part at a price of Rs.10 each.

In case AJ is agreeable to supply the part to DJ, it has two alternatives namely: (a) to supply 2000 parts from its existing productive capacity by diverting supplies from outside customers or (b) to supply 2000 parts by resorting to overtime working, AJ will incur additional production costs of Rs.4,000 on the output of 2,000 parts.

Discuss the effect of the following decisions on each of the manufacturing divisions as well as on the overall profitability of the company as a whole with suitable calculations:

- AJ supplies part 35 to DJ at Rs.10 each.
- AJ refuses to supply part 35 at Rs.10 each but agrees to supply the same at Rs.15 each by diverting supplies from outside market.
- DJ produces product 'M' by using part 35 purchases from outside market at Rs.15 each.
- AJ manufactures 2,000 units of the part by resorting to overtime and supplies the same to DJ at Rs.15 each.

[Ans.: Profit of Co. in Alt I: Rs. 131000; Alt II: 131000; Alt III: 131000; Alt IV: 140000]

Question 16: S.V.Ltd. manufactures a product which is obtained basically from a series of mixing operations. The finished product is packaged in the company made Glass Bottles and packed in attractive cartons.

The company is organized into two independent divisions viz, one for the manufacture of the End product and the other for the manufacture of Glass Bottles. The product manufacturing division can buy all the bottle requirements from the Bottle manufacturing division.

The General Manager of the Bottle manufacturing division has obtained the following quotations from the outside manufacturers for the supply of empty bottles.

Volume (Empty bottles)	Total purchase value (Rs)
8,00,000	14,00,000
12,00,000	20,00,000

A cost analysis of the Bottle manufacturing division for the manufacture of empty bottles reveals the following production costs.

Volume (Empty bottles)	Total cost (Rs.)
8,00,000	10,40,000
12,00,000	14,40,000

The production cost and sales value of the end product marketed by the product manufacturing division are as under;

Volume	Total cost of end Product (Excluding cost of empty bottles Rs.)	Sales value (Packed in bottles Rs.)
Bottles of end product		
8,00,000	64,80,000	91,20,000
12,00,000	96,80,000	127,80,000

There has been considerable discussion at the corporate level as to the use of proper price for transfer of empty bottles from the Bottle manufacturing division to product manufacturing division. This interest is heightened because a significant portion of the Divisional Manager's salary is in incentive bonus based on profit centre results.

As the corporate Management Accountant responsible for defining the proper transfer prices for the supply of empty bottles by the bottle manufacturing division to the product manufacturing division. You are required to show for the two levels of volumes of 8,00,000 and 12,00,000 bottles, the profitability by using (1) Market price and (2) Shared profit relative to the costs involved basis for the determination of transfer prices. The profitability position should be furnished separately for the two divisions and the company as a whole under each method. Discuss also the effect of these methods on the profitability of the two divisions.

[Ans.: Profitability based on cost : On 800000 bottles, Bottle Mfg Division: Rs. 221276; Product Mfg Division: Rs. 1378324; On 1200000 bottles, Bottle Mfg Division: Rs. 214964; Product Mfg Division: Rs. 1445036; Profitability based on market price : On 800000 bottles, Bottle Mfg Division: Rs. 360000; Product Mfg Division: Rs. 1240000; On 1200000 bottles, Bottle Mfg Division: Rs. 560000; Product Mfg Division: Rs. 1100000]

Question 17: A company is organized into two large Divisions. Divisions 'A' produces a component which is used by Division 'B' in making a final product. The final product is sold for Rs.400 each. Division A has a capacity to produce 2,000 units and the entire quantity can be purchased by Division B.

Division A informed that due to installation of new machines, its depreciation cost had gone up and hence wanted to increase the price of the component to be supplied to Division B to Rs.220. Division B, however can buy the component from the outside market at Rs.200 each. The variable costs of Division A is Rs. 190 and fixed costs Rs. 20 per component. The variable costs of Division B in manufacturing the final product by using the component is Rs.150 (excluding the component cost.)

Present statement indicating the position of each of the following situations separately.

- (1) If there are no alternative used for the production facilities of A, will the company benefit if Division B buys from outside suppliers at Rs.200 per component?

(2) If internal facilities of A are not otherwise idle and the alternative use of the facilities will give an annual cash operating saving of Rs.30,000 to Division A, should Division B purchase the component from outside suppliers?

(3) If there are no alternative used for the production facilities of Division A and the selling price for the component in the outside market drops by Rs.15, should Division B purchase from outside suppliers?

(4) What transfer price would you fix for the component in each of the above circumstances?

[Ans.: (i) If Component is purchased from outside, Co.'s Contribution is Rs. 100000 & If Component is purchased from Division A, Co.'s Contribution is Rs. 120000 (ii) If Component is purchased from outside, Co.'s Contribution is Rs. 130000 (iii) If Component is purchased from outside, Co.'s Contribution is Rs. 130000 (iii) When there are no alternative uses Transfer Price is Rs. 190, When there are alternative uses Transfer Price is Rs. 205 & If market price get reduced to Rs. 185 and there are no alternative uses, Transfer Price is Rs. 190]

Question 18: A company has two Division viz., LD and KD, LD operates at full capacity and KD operates at 50% Capacity.

LD produces two products, LX and LY using the same labour force for each product. The direct wage rate per production hour is Rs. 5. During the next year, its budgeted capacity of 42,000 direct labour hours involves a commitment to sell 6,000 kg of LY. The balance capacity will be used for the production of LX. Cost data are: (Rs. Kg.)

	LX	LY
Direct Materials	36	28
Direct Wages	30	20

The Company's overhead amount to Rs.7,56,000 per annum relating to LX and LY in proportion to their wages. At full capacity Rs.4,20,000 of this overhead is variable, LD prices its products with 50% mark-up on its total costs.

KD wishes to buy 2,000 kgs of LX from LD for being processed into KX to be sold at Rs. 300 per kg. The processing materials and wage cost are Rs.30 per kg. and the variable overheads amount to Rs. 4 per kg. The fixed costs amount to Rs. 1,00,000 per annum.

Prepare a report showing the profitability of LD and KD and the company as a whole for each of the following transfer price methods:

- (1) LD transfers LX at a price applicable to outside customers on the basis of total cost.
- (2) LD transfers LX at a price based on total costs less credit for selling and distribution expenses of Rs.4 per kg. which will not be incurred in respect of the sale to KD.
- (3) LD transfers LX at a price based on marginal cost as reduced by Rs.4 per kg. of selling and distribution expenses.
- (4) LD manufactures the quantity of LX required by KD by employing overtime payable at double the normal wage rate and transfers a marginal cost less Rs. 4 per kg. being selling and distribution costs not incurred in respect of sale to KD. LD sells the entire regular production to outside customers at the usual price.

[Ans.: (1) Profit of Division LD: Rs. 629000, Loss of Division KD: Rs. 90000, Total Profit of Co.: Rs. 539000 (2) Profit of Division LD: Rs. 621000, Loss of Division KD: Rs. 82000, Total Profit of Co.: Rs. 539000 (3) Profit of Division LD: Rs. 351000, Profit of Division KD: Rs. 1880000, Total Profit of Co.: Rs. 539000 (4) Profit of Division LD: Rs. 621000, Profit of Division KD: Rs. 128000, Total Profit of Co.: Rs. 749000]

Question 19: A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division manager has full authority to decide on sale of division's output to outsiders or to other divisions. Division AB manufactures a single standardised product. Some output is sold externally and remaining is transferred to division XY where it is a sub-assembly in the manufacture of the division product. The unit cost of division AB product and division XY is as follows:

	Division AB (Rs.)	Division XY (Rs.)
Transfer from division AB to XY	-	42.00
Direct material	6.00	35.00
Direct labour	3.00	4.50
Direct expenses	3.00	-
Variable manufacturing overheads	3.00	18.00
Fixed manufacturing overheads	6.00	18.00
Variable selling and packing expenses	<u>3.00</u>	<u>2.50</u>
	<u>24.0</u>	<u>120.00</u>

Division AB sold 40,000 units annually at the standard price of Rs. 45 in external market. In additions to the external sales, 10,000 units are transferred annually to division XY at internal price of Rupees 42 per unit. Variable selling and packing expenses are not incurred by supplying division for the internal transfer of the product. Division XY incorporates the transferred goods into more advance product. The manager of division XY disagrees with the basis used to set the transfer price. He argues that transfer price should be made at variable cost since he claims that his division is taking output that division AB should be unable to sell at price Rs. 45.

He also submitted a report of the relationship between selling price and demand to support of his disagreement. The report of customer demand at various selling prices for division AB and for division XY is as follows:

Division AB			
Selling price per unit (Rs.)	30	45	60
Demand (Units)	60,000	40,000	20,000
Division XY			
Selling price per unit (Rs.)	120	135	150
Demand (Units)	15,000	10,000	5,000

The company has sufficient capacity to meet demand at various selling prices. Internal transfer demanded units will be decided by XY division.

Required:

- To calculate divisional profitability and overall profitability of company if division AB transfers demanded units to XY at price of Rs. 42.
- To calculate divisional profitability and overall profitability of company if division AB transfers demanded units to XY at variable cost.
- In place of internal transfers, AB division can sell 10000 units of their product in new external market without effecting existing market, at price Rs. 32 per unit and XY division can purchase these units at the rate of Rs. 31 in open market. Calculate company's profit by following above strategies.

[Ans.: (a) Profitability- Div. AB: Rs. 1050000, Div. XY: Rs. 150000, Cos.: Rs. 1200000; (b) Profitability: Div. AB: Rs. 780000, Div. XY: Rs. 495000, Cos.: Rs. 1275000; (a) Profitability: Div. AB: Rs. 920000, Div. XY: Rs. 260000, Cos.: Rs. 1180000] (12 Marks) June/09[Old Course]

Question 20: Division A of a large divisionalised organization manufactures a single standardized product. Some of the output is sold externally whilst the remainder is transferred to Division B where it is a sub-assembly in the manufacture of that Division's product. The unit cost of Division A's product are as follows:

	(Rs.)
Direct Material	4
Direct Labour	2
Direct expenses	2
Variable manufacturing overheads	2
Fixed manufacturing overheads	4
Selling and packing expenses- Variable	1
Total	15

Annually 10,000 units of the product are sold externally at the standard price of Rs.30. In addition to the external sales, 5,000 units are transferred annually to Division B at an internal transfer charge of Rs.29 per unit. This transfer price is obtained by deducting variable selling and packing expenses from the external price since these expenses are not incurred for internal transfers.

Division B incorporates the transferred goods into a more advanced product. The unit costs of the product are as follows:

	(Rs.)
Transferred in item (from Division A)	29
Direct material and components	23
Direct labour	3
Variable overheads	12
Fixed overheads	12
Selling and packing expenses- Variable	1
Total	80

Division B's manager disagrees with the basis used to set the transfer price. He argues that the transfer should be made at variable cost plus an agreed (minimal) mark-up since he claims that his division is taking output that Division A should be unable to sell at the price of Rs.30.

Partly because of this disagreement, a study of the relationship between selling price and demand has recently been made for each division by the company's Sales Director. The resulting report contains the following table:

Customer demand at various selling prices:

Division A

Selling price (Rs.)	Rs.20	Rs.30	Rs.40
Demand (units)	15,000	10,000	5,000

Division B

Selling price (Rs.)	Rs.80	Rs.90	Rs.100
Demand (units)	7,200	5,000	2,800

The Manager of Division B claims that this study supports his case. He suggests that a transfer price of Rs.12 would give Division A a reasonable contribution to its fixed overheads while allowing Division B to earn a reasonable profit. He also believes that it would lead to an increase of output and an improvement in the overall level of company's profits.

You are required to:

1. Calculate the effect of the transfer pricing system on the company's profits, and
2. Establish the likely effect on profits if adopting the suggestion by the Manager of Division B for a transfer price of Rs.12.

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[Ans.: 1. Profit for the company as a whole from the sale of the final product are reduced from Rs. 223200 (7200 units) to Rs. 205000 (5000 units) 2. Apart of Contribution of Rs. 190000 from sale of intermediate product to the external market, contribution of Division A is Rs. 14400 and of Division B is Rs. 208800.]

[Hint: Assume that the company has sufficient capacity to meet demand at various selling prices]

Question 21: A company has three departments viz., A, B and C.

A basic raw material is introduced into department 'A' where by-product BYEA emerges. The annual output of BYEA is 3,000 tonnes. Out of this, 30% can be sold at Rs.200 per tonne in a controlled market and the balance of 70% can be sold in the open market at Rs.1,200 per tonne.

Alternatively, department 'A' can transfer the entire quantity of production of BYEA at the opportunity cost to department 'B' where, after processing, product RESP can be manufactured. One tonne of BYEA will yield 200 liters of RESP. The fixed costs of department 'B' will amount to Rs.12 lacs and the variable costs will work out to Rs.4 per liters of RESP. The entire quantity of RESP can be sold by department 'B' at Rs.15 per liter.

Department 'B' can also transfer its output of RESP at Rs.15 per liter to department 'C' where it can be further processed into POTS and packed in polythene sachets for sale. One liter of RESP will yield 1.6 liters of POTS. The plant will however have to allow for a packing wastage of 5% of the input of RESP used by department 'C' for manufacture of POTS.

Department 'C' has a contract for sale of POTS in two packing as detailed below:

Pack	Selling Price (Rs./pack)	% of Production for sale
200 ML	2.50	75%
300ML	3.50	25%

The manufacturing cost of department 'C' will work out to Rs.1.50 per liter of POTS actually produced and sold. One liter = 1000ML.

Required:

- (1) Calculate the income from the sale of BYEA if department 'A' elects to sell the by product BYEA to outside customers.
- (2) Using the opportunity cost principle find the profit / loss arising from the manufacture and sale of RESP by department 'B'.
- (3) Present a statement showing the profit / loss arising from the sale of POTS manufactured by department 'C' from out of RESP supplied by department 'B'
- (4) If department 'B' is closed down and department 'C' is able to obtain RESP at Rs.6.25 per liter in exchange of the entire quantity of BYEA produced by department 'A' at the rate of 120 liters of RESP for every tonne of BYEA supplied to outside firm, will it be more profitable for the company as a whole to produce and sell POTS? Show the calculations.

[Ans.: (i) Dept. A: Rs. 2700000, (ii) Dept. B: Rs. 2700000 (iii) Dept. C: 912000 Ltrs., Rs. 842000 (iv) Profit under existing arrangement Rs. 6242000 & Profit under new arrangement Rs. 2455200]

Question 22: P Ltd. has two divisions, S and T, S transfer all its output to T, which finishes the work costs and revenues at various levels of capacity are as follows:

Output	S .costs	T Net revenues (i. e, revenue minus costs incurred in T)	Profit
Units	Rs.		Rs.
600	600	2,950	2,350
700	700	3,250	2,550

800	840	3,530	2,690
900	1,000	3,780	2,780
1,000	1,200	4,000	2,800
1,100	1,450	4,200	2,750
1,200	1,800	4,350	2,550

Company profits are maximized at Rs.2,800 with output of 1,000 units. If P Ltd. wish to select a transfer price in order to establish S and T as profit centers, what transfer price would motivate the managers of S and T together to produce 1,000 units , no more and no less?

P Ltd. wants that the transfer price should be set at Rs.2.10 per unit. Comment on this proposal.

[Ans. Transfer price must be selected in the range Rs. 2.00 to Rs. 2.20 per unit(exclusive). At a transfer price of Rs. 2.10 any increase in output above 1000 units, or any shortfall in output below this would not only reduce the profits of the company as a whole but also the divisional profits of Divisions S and T]

Question 23: A Ltd. produces P by its two divisions X and Y . P is first processed in X and then in Y .X and Y are treated as profit centers . The cost value-profit structure is as given below:

Output Units	X Costs Rs.	T Net revenue Rs.	Profit Rs.
1000	900	4000	3100
1100	1000	4300	3300
1200	1120	4540	3420
1300	1250	4730	3480
1400	1400	4900	3500
1500	1580	5030	3450
1600	1800	5110	3310

Note: Net revenue for Y means the sale proceeds minus costs incurred in y. these costs do not include the price of transferred material chargeable by X.

Required : (a) Discusses the problem. (b) Fix and explain the optimum transfer price for .Ltd.

[Ans.: Rs. 1.6]

Question 24: BETAGRO Ltd. which has a system of assessment of Divisional performance on the basis of residual income has two divisions Alfa and Beta. Alfa has annual capacity to manufacture 15 lakhs Nos. of a special component which it sells to outside customers: but has idle capacity. The budgeted residual income of Beta is Rs.120 lakhs while that of Alfa is Rs.100 lakhs .Other relevant details extracted from the Budget of Alfa for the year are:

Sales (to outside customers)	12 lakhs unit @ Rs.180per unit
Variable cost per unit	Rs.160
Divisional fixed cost	Rs.80 lakhs
Capital employed	Rs.750 lakhs
Cost of capital	12%

Beta has just received a special order for which it requires components similar to the ones made by Alfa. Fully aware of Alfa's unutilized capacity. Beta has asked Alfa to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. Alfa and Beta agree that this will involve an extra variable cost of Rs.5 per unit.

- (1) Calculate the transfer price which Alfa should quote to Beta to achieve its budgeted residual income.
- (2) Indicate the circumstances in which the proposed transfer price may result in a sub-optimal decision for the BETAGRO group as a whole.

[Ans.: Minimum Transfer price to be quoted will be Rs. 175]

[Hint: Residual Income is the net operating profit after taxes on an investment center in excess of its required profit. Residual Income = NOPAT – Cost of Capital × Investment]

Question 25: AB Ltd. manufactures foam, carpet and upholstery in its three divisions. Its operating statement for 2001-02 showing the performance of these divisions drawn for the use of arrangement is reproduced below:

Particulars	Manufacturing Divisions			Total
	Foam 1600(A)	Carpets 1200	Upholstery 1200	
Sales revenue				4000
Manufacturing costs				
Variable	1200	700	680	2580
Fixed (Traceable)	-	100	20	120

	1200	800	700	2700
Gross profit	400	400	500	1300
Expenses				
Administration	134	116	172	422
Selling	202	210	232	644
	336	326	404	1066(B)
Net Income	64	74	96	234
Division's Ranking	3 rd	2 nd	1 st	

(A) Sales include foam transferred to the upholstery division at its manufacturing cost Rs. 2,00,000.

(B) Common expenses of Rs.1,30,000 and Rs.1,00,000 on account of administration and selling respectively stand apportioned to these divisions at 10% of gross profit in case of administration and 2.5% of sales in case of selling expenses. Rest of Rs. 8,36,000 of the expenses are traceable to respective divisions.

The manager of the foam division is not satisfied with the above approach of presenting operating performance. In his opinion his division is best among all the divisions. He requests the management for preparation of revised operating statement using contribution approach and showing internal transfer at market price.

You are required to:

- Draw the revised operating statement using contribution approach and pricing the internal transfer at market price.
- Compute relevant ratios to show comparative profitability of these divisions and rank them in the light of your answer at (a) above. Further, offer your comments on the collection of the manager of foam division.
- State why the contribution approach and pricing of internal transfers at market price are more appropriate in realistic assessment of the performance of various divisions. (May/96)

[Ans.: (a) Net Income Rs. ('000)234; (b) Contribution margin ratio Foam 28.57%, Carpet 41.67% , Upholstery 36.67% Net contribution ratio & ranking Foam 13.33%(I) Carpets 12%(II) and Upholstery 8%(III)]

Question 26: Your company fixes the inter-divisional transfer prices for its products on the basis of cost, plus a return on investment in the division. The Budget for Division A for 1998-99 appears as under:

Investment in Division A

	Rs.
Fixed Assets	5,00,000
Current Assets	3,00,000
Debtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of product	10

Budgeted volume 4,00,000 units per year
Desired ROI 28%

Determine the transfer price for Division A.

[Ans.: Rs. 12.70]

Question 27: A Company has two Divisions, Division 'A' and Division 'B'. Division 'A' has a Budget of selling 2,00,000 Nos. of a particular component 'x' to fetch a return of 20% on the average assets employed. The following particulars of Division 'A' are also known:

Fixed Overhead	Rs.5 lakhs
Variable Cost	Rs.1 per unit
<i>Average Assets</i>	
Sundry Debtors	Rs.2 lakhs
Inventories	Rs.5 lakhs
Plant & equipments	Rs.5 lakhs

However, there is constraint in Marketing and only 1,50,000 units of the component 'x' can be directly sold to the Market at the proposed price.

It has been gathered that the balance 50,000 units of component 'x' can be taken up by Division 'B'. Division 'A' wants a price of Rs.4 per unit of 'x' but Division 'B' is prepared to pay Rs.2 per unit of 'x'.

Division 'A' has another option in hand. Which is to produce only 1,50,000 units of component 'x'. This will reduce the holding of assets by Rs.2 lakhs and fixed overhead by Rs.25,000.

You are required to advise the most profitable course of action for Division 'A'. (15 Marks) Nov./97
[Ans.: Sell 150000 units in market and transfer 50000 units to Division B as Division A's Profit and ROCE is increased by Rs. 25000 and 0.75% respectively]

Question 28: A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division manager has full authority to decide on sale of the division's output to outsiders and to the other divisions.

Division C has always purchase its requirement of a component from Division A. But when informed that division was increasing its selling price to Rs 150, the manager of Division C decided to look at outside suppliers.

Division C can buy the component from an outside supplier for Rs 135. But Division A refuses to lower its price in view of its need to maintain its return to the investment.

The top management has the following information:

C's annul purchase of the component	1000 units
A's variable cost per unit	Rs 120
A's fixed cost per unit	Rs 20

Required:

- Will the company as a whole benefit, if Division C bought the component at Rs 135 from an outside supplier?
- If A did not produce the material for C, it could use the facilities for other activities resulting in a cash operating savings of Rs 18000. Should C then purchase from outside source?
- Suppose there is no alternative use of A's facilities and the market price per unit of the component drops by Rs 20. Should C now buy from outside?

(13 Marks) Nov/98

[Ans.: (i) The co. as a whole will not benefit as it will be required to incur an additional cost of Rs. 15000; (ii) It is advisable that Division C should purchase the component from outside sources as the decision will benefit the company by Rs. 3000; (iii) It is advisable that the Division C should buy the component from outside as the decision will benefit the company by Rs. 5000]

Question 29: City Instrument Company (CIC) consist of the Semi-conductor Division and the Mini-computer Division, each of which operates as an independent profit centre. Semi-conductor Division employs craftsmen, who produce two different electronic components, the new- high performance Super chip and an old product called Okay-chip. These two products have the following cost characteristics:

	Super-chip		Okay-chip	
Material	Parts	Rs 20	Parts	Rs 10
Labour	2 hours x Rs 140	280	1/2 x Rs 140	70

Annual Overhead in Semi-conductor Division is Rs 4000000 all fixed. Owing to high skill level necessary for the craftsmen, the Semi-conductor Division's capacity is set at 50000 hours per year.

To date, only one customer has developed a product utilizing super-chip, and this customer orders a maximum of 15000 super-chips per year at a price of Rs 600 per chip. If CIC can not meet his entire demand, the customer curtails his own production. The rest of the semi-conductor's capacity is devoted to Okay-chips, for which there is unlimited demand at Rs 120 per chip.

The Mini-computer Division produces only one product, a process control unit, which requires a complex circuit board imported at a price of Rs 600. The control unit's cost are:

	Control Unit	
Material	Circuit board	Rs 600
	Other parts	80
Labour	5 hours @ Rs 100	500

The Mini-computer Division is composed of only a small assembly plant and all overhead is fixed at a total of Rs 800000 per year. The current market price for the control unit is Rs 1400 per unit.

A joint research project has just revealed that with minor modifications, a single super-chip could be substituted for the circuit board currently used by the Mini-computer division. The modification would require an extra one hour of labour by Mini-computer's staff, for a total of 6 hour per control unit. Mini-computer has therefore asked Semi-conductor division to declare a transfer price at which Semi-conductor division would sell super-chip internally.

Required:

- Mini-computer expects to sell 5000 control units this year. From the overall view point of CIC, how many super-chips should be transferred to Mini-computer Division to replace circuit boards?
- If the demand for the control units is sure to be 5000 units, but its price is uncertain, what should be the transfer price of super-chip to ensure proper decisions? (All other data unchanged.)

- (iii) If demand for the control unit rises to 12000 units at a price of Rs 1400 per unit, how many of 12000 units should be built using super-chip? (All other data unchanged.) (13 Marks) Nov/00

[Ans.: (i) 5000 units (ii) Rs. 460; (iii) 10000 units]

Question 30: A Company is engaged in the manufacture of edible oil. It has three division as under:

- (i) Harvesting oil seeds and transportation therefore to the oil mill.
- (ii) Oil Mill, which process oil seeds and manufactures edible oil.
- (iii) Marketing Division, which packs the edible oil in 2 kg. containers for sale at Rs 150 each container.

The Oil Mill has a yield of 1000 kgs. of oil seeds during a period. The Market Division has a yield of 500 cans of edible oil of 2 kg. each from every 1000 kg. of oil. The net weight per can is 2 kg. of oil.

The cost data for each division for the period are as under:

Harvesting Division:

Variable cost per kg of oil seed	Rs 2.50
Fixed cost per kg. of oil seed	Rs 5.00

Oil Mill Division:

Variable cost of processed edible oil	Rs 10.00 per kg.
Fixed cost of processed edible oil	Rs 7.50 per kg.

Marketing Division:

Variable cost per can of 2 kg of oil	Rs 3.75
Fixed cost per can of 2 kg of oil	Rs 8.75

The fixed cost are calculated on the basis of estimated quantity of 2000 kg of oil seeds harvested, 1000 kg of processed oil and 500 cans of edible oil packed by the aforesaid divisions respectively during the period under review.

The other oil mills buy the oil seeds of the same quality at Rs 12.50 per kg. in the market. The market price of edible oil processed by the oil mill, if sold without being packed in the marketing division is Rs 62.50 per kg of oil.

Required:

- (i) Compute the overall profit of the company of harvesting 2000 kg of oil seeds, processing it into edible oil and selling the same in 2 kg cans as estimated for the period under review.
- (ii) Compute the transfer prices that will be used for internal transfer from
 - (1) Harvesting Division to Oil Mill Division and
 - (2) From Oil Mill Division to Marketing Division
 under the following pricing methods:
 - (1) Shared contribution in relation to variable cost; and
 - (2) Market price.
- (iii) Which transfer pricing method will each divisional manager prefer to use? (12 Marks) May/01

[Ans.: (i) Rs. 36250; (ii) (1) Rs. 66667 (2) Rs. 62500; (iii) Harvesting Division Manager-Market Price method, Oil Mill Division Manager shared contribution method, Marketing Division Manager-Market Price Method]

Question 31: The two manufacturing divisions of a company is organized on profit centre basis. Division X is the only source of a component required by Division Y for their product P. Each unit of P requires one unit of the said component. As the demand of the product is not steady, orders for increased quantities can be obtained by manipulating prices. The manager of Division Y has given the following forecast:

Sales per day (units)	Average price per unit of P (Rs.)
5,000	393.75
10,000	298.50
15,000	247.50
20,000	208.50
25,000	180.00
30,000	150.75

The manufacturing cost (excluding the cost of the component from Division X) of P in Division Y is Rs 1406250 on first 5000 units and Rs 56.25 per unit in excess of 5000 units.

Division X incurs a total cost of Rs 562500 per day for an output up to 5000 components and the total cost will increase by Rs 337500 per day for every additional 5000 component manufactured. The manager of Division X has set the transfer price for the component at Rs 90 per unit to optimize the performance of his Division.

Required:

- (i) Prepare a divisional profitability statement at each level of output, for division X and Y separately;
- (ii) Find out the profitability of the company as a whole at the output level where:
 - (a) Division X's net profit is maximum;
 - (b) Division Y's net profit is maximum.
- (iii) Find out at what level of output, the company will earn maximum profit, if the company is not organized on profit centre basis. (15 Marks) May/02

[Ans.: (i) At 30000 components profitability of X Rs. 450000, loss of Y Rs. 990000 (iii) Operating Loss of the company X Rs. 540000, Profitability of Company Y Rs. 397500; (iii) Maximum profit will be attained if 15000 components are produced.]

Question 32: Division Z is a profit centre, which produces four products – A B C and D. each product is sold in the external market also. Data for the period as follows:

	A	B	C	D
Market Price Per Unit	Rs 150	Rs 146	Rs 140	Rs 130
Variable Cost of Production Per Unit	Rs 130	Rs 100	Rs 90	Rs 85
Labour Hours Required Per Unit	3	4	2	3

Production D can be transferred to division Y, but the maximum quantity that might be required for transfer is 2500 units of D.

The maximum sales in the external market are:

A	2800 units
B	2500 units
C	2300 units
D	1600 units

Division Y can purchase the same product as a slightly cheaper price of Rs 125 per unit instead of receiving transfers of product D from division Z.

What should be the transfer price for each unit for 2500 units of D, if the total labour hours available in division Z are:

- (i) 20000 hours?
- (ii) 30000 hours?

(13 Marks) May/00

[Ans.: Transfer Price per unit Rs. 118.34; (ii) Transfer Price per unit Rs. 99.13]

Question 33: Division A is a profit centre which produces three products X, Y and Z. Each product has an external market.

Products	X	Y	Z
	Rs.	Rs.	Rs.
External market price per unit	48	46	40
Variable cost of production in division A	33	24	28
Labour hours required per unit in division A	3	4	2

Product Y can be transferred to Division B, but the maximum quantity that might be required for transfer is 300 units of Y.

The maximum external sales are:

X	800 units	Y	500 units	Z	300 units
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Instead of receiving transfers of product Y from Division A, Division B could buy similar product in the open market at a slightly cheaper price of Rs. 45 per unit.

What should the transfer price be for each unit for 300 units of Y, if the total labour hours available in Division A are:

- (a) 3,800 hours
- (b) 5,600 hours

[Ans.: (a) Rs. 44 (b) Rs. 34]

Question 34: Department x is a profit centre manufacturing products Vx, X and Xt. Each of the products can be sold in the outside market to the extent of the following:

Vx	900 units
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X 300 units
Xt 600 units
Market price per unit is Rs 24, Rs 23, and Rs 20 for Vx, X and Xt respectively. Other details are given below:

	Vx	X	Xt
	Rs.	Rs.	Rs
Variable cost of production	17	12	14
Labour hours required	3	2	4

Product Vx can be transferred to department y, but the maximum quantity that might be required for transfer is 400 units of Vx. The Manager of department y has powers to buy the product Vx from the external market at a much cheaper price of Rs 22.

What should be the transfer price for each unit for 400 units of Vx, if the total labour hours available in department X is:

- (a) 4800 hours
(b) 6200 hours?

(12 Marks) Nov/03

[Ans.: (a) Rs. 21.50 (b) Rs. 19.625]

Question 35: A Company is organised into two divisions. Division X produces a component, which is used by division Y in making of a final product. The final product is sold for Rs540 each. Division X has capacity to produce 2,500 units and division Y can purchase the entire production. The variable cost of division X in manufacturing each component is Rs256.50.

Division X informed that due to installation of new machines, its depreciation cost had gone up and hence wanted to increase the price of component to be supplied to division Y to Rs297, however division Y can buy the component from outside the market at Rs270 each. The variable cost of division Y in manufacturing the final product by using the component is Rs202.50 (excluding component cost).

Present the statement indicating the position of each Division and the company as whole taking each of the following situations separately:

- If there is no alternative use for the production facility of X, will the company benefit, if division Y buys from outside suppliers at Rs270 per component.
- If internal facilities of X are not otherwise idle and the alternative use of the facilities will bring an annual cash saving of Rs50,625 to division X, should division Y purchase the component from outside suppliers?
- If there is no alternative use for the production facilities of division X and the selling price for the component in the outside market drops by Rs20.25, should division Y purchase from outside supplier?
- What transfer price would be fixed for the component in each of the above circumstances?

[Ans.: (i) It will be beneficial for the company as whole to buy component from Division X (ii) & (iii) It is beneficial to buy component from outside. (iv) Transfer price (a) Rs. 256.50 per component, (b) Rs. 276.75 per component, (c) Rs. 256.50 per component.]

(12 Marks) Nov/05

Question 36: X Ltd. has two divisions, A and B, which manufacture products A and B respectively. A and B are profit centres with the respective Divisional Managers being given full responsibility and credit for their performance.

The following figures are presented:

	Division A Rs. Per Unit	Division B Rs. Per Unit
Direct material cost	50	24* (other than A)
Material A, if transferred from Division A	—	144
Material A, if purchased from outside	—	160
Direct labour	25	14
Variable production overhead	20	2
Variable selling overhead	13	26
Selling price in outside market	160	300
Selling price to B	144	—
Selling price to S Ltd.	—	250

Other Information:

To make one unit of B, one unit of component A is needed. If transferred from A, B presently takes product A at Rs.144 per unit, with A not incurring variable selling overheads on units transferred to B.

Product A is available in the outside market at Rs. 160 per unit from competitors.

B can sell its product B in the external market at Rs. 300 per unit, whereas, if it supplied to X Ltd.'s subsidiary, S Ltd., it supplies at Rs. 250 per unit, and need not incur variable selling overhead on units transferred to S

Ltd. S Ltd. requires 6,000 units and stipulates a condition that either all 6,000 units be taken from B or none at all.

	A (units)	B (units)
Manufacturing capacity	20,000	28,000
Demand in external market	18,000	26,000
S Ltd.'s demand	—	6,000 or zero

Assume that Divisions A and B will have to operate during the year.

What is the best strategy for:

- Department A?
- Department B, given that A will use its best strategy?
- For X Ltd. As a whole?

(14 Marks) May/08

[Ans.:(i) Sell 18000 units in market and 2000 units to B. Total Contribution Rs. 1034000 (ii) Get 2,000 units from A, sell 6,000 units to S and 20,000 to outside. Make 28,000 units @ full capacity. Total Contribution Rs. 19,60,000 (iii) Make A transfer all output to B. Sell 6,000 units of B to S and 22,000 units to outside market. This will make X Ltd. better off by 32,28,000 – 29,94,000 = Rs 2,34,000]

Question 37: Fasteners Ltd. is having production shops reckoned as cost centres. Each shop charges other shops for material supplied and services rendered.

The shops are motivated through goal congruence, autonomy and management efforts. Fastner Limited is having a welding shop and painting shop. The welding shop welds annually 75,000 purchased items with other 1,50,000 shop made parts into 12,000 assemblies. The assemblies are having variable cost of Rs. 9.50 each and are sold in market at Rs. 12 per assembly. Out of the total production, 80% is diverted to painting shop at same price ruling in the market. Welding shop incurs a fixed cost of Rs. 25,000 per annum. The painting shop is having fixed cost of Rs. 30,000 and its cost of painting including transfer price from welding shop comes to Rs. 20 per unit. This shop sells all units transferred to it by welding shop at Rs. 25 per assembly.

You are required to:

- Find out profit of individual cost centres and overall profitability of the concern.
- Recommend course of action if painting shop wishes to purchase its full requirement (at market price which is Rs. 10 per assembly) either from open market or from welding shop at market price of Rs. 10 per assembly.

Give reasons for your recommendations

[Ans.: (a) Overall profit for the company (Rs. 5,000 + Rs. 18,000) = Rs. 23,000]

Question 38: Division A of Better Margins Ltd. has been given a budgeted target of selling 2,00,000 components COM 21, it manufactures at a price which would fetch a return of 25% on the average assets employed by it. The following figures are relevant:

Fixed overhead	Rs. 4,00,000
Variable cost	Rs. 1 per unit
Average assets :	
Sales debtors	2,00,000
Stocks	6,00,000
Plant and other assets	4,00,000

However, the marketing department of the company finds out by a survey that the maximum number of COM 21, the market can take, at the proposed price is only 1,40,000 units.

Fortunately Division B is willing to purchase the balance 60,000 units. The Manager, Division A is willing to sell to Division B at a concessional price of Rs. 4 per unit. But the Manager, Division B is ready to pay Rs. 2.25 only per unit, as he feels he can himself make COM 21 in his Division at that price.

Rather than sell to Division B at Rs. 2.25, the Manager, Division A feels he will restrict the activity of his Division to the manufacture and sale of 1,40,000 components only. By this, he could reduce Rs. 80,000 in stocks, Rs. 1,20,000 of plant and other assets and Rs. 40,000 in selling and administration expenses.

As a Cost Accountant, you are asked to work out the various computations and show that selling 60,000 COM 21 to Division B at Rs. 2.25 per unit would be in the interest of the organization.

Question 39: A boatyard is divided into three profit centers whose managers are rewarded according to results. Transactions between these profit centres are frequent.

Sales centre (S) buys and sells new boats.

If it needs to take part-exchange from a customer in order to sell a new boat, it transfers the part-exchanged boat to B at an agreed price.

Brokerage (B) buys and sells second-hand boats:

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- (i) in part-exchange from S (B names the price at which it can buy a comparable boat that is in a suitable condition for resale to an end-user customer, but deducts the likely cost of repairs) and
- (ii) from other sources, on a normal trading basis.

Repairs (R) does repairs for

- (i) B (to put boats into saleable condition) and
- (ii) other customers.

The following situation arises:

S can sell to a customer for Rs. 35,000 a new boat which would cost Rs. 29,000. To do so, it needs to offer Rs. 16,000 in part-Exchange for the customer's old boat. However, the customer's boat is estimated by R to need repairs that will cost:

Materials Rs. 300
Labour 60 hours at Rs. 15 per hour

B can buy for Rs. 15,000 a boat comparable to the one being offered by the customer in part-exchange but which needs no repair. B could then sell that boat for Rs. 19,000.

Other data:-

R's labour rate per hour is made up as follows: Rs.

Variable cost 6.00
Fixed cost 4.50 (based on 20,000 budgeted hours p.a.)
Profit 4.50
15.00

- 45% of R's time is reserved for work from B
- Annual fixed cost is budgeted at:

S Rs.70,000

B Rs. 80,000

You are required, in relation to the above situation, to set out the contribution to profit for each profit centre that would result:

- (i) assuming that all estimates and budgets materialized as expected,
- (ii) assuming that all estimates and budgets materialized as in (i), except that the repairs undertaken by R took an extra 10 hours and Rs. 100 of materials due to a problem not noticed by B or R.

[Ans.: (i) Contribution Rs. 540 (ii) Increased contribution Rs. 630]

Question 40: Tripod Ltd. has three divisions X, Y and Z, which make products X, Y and Z respectively. For division Y, the only direct material is product X and for Z, the only direct material is product Y. Division X purchases all its raw material from outside. Direct selling overhead, representing commission to external sales agents are avoided on all internal transfers. Division Y additionally incurs Rs. 10 per unit and Rs. 8 per unit on units delivered to external customers and Z respectively. Y also incurs Rs. 6 per unit picked up from X, whereas external suppliers supply at Y's factory at the stated price of Rs. 85 per unit.

Additional information is given below:

Figures Rs./unit

	X	Y	Z
Direct materials (external supplier rate)	40	85	135
Direct labour	30	50	45
Sales Agent's commission	15	15	10
Selling price in external market	110	170	240
Production capacity	20,000	30,000	40,000 units
External demand	14,000	26,000	42,000 units

You are required to discuss the range of negotiation for Managers X, Y and Z, for the number of units and the transfer price for internal transfers.
(11 Marks) Nov./08-New Course



Relevant Costing – Decision Making

A decision model is a format method of making choice, and it often involves both quantitative and qualitative analyses. Management accountants work with managers by analyzing and presenting relevant data to guide decisions.

Incremental Costing: (CIMA's Official terminology) It is a technique used in the preparation of ad hoc information where consideration is given to a range of graduated or stepped changes in the level or nature of activity, and the additional costs and revenues likely to result from each degree of change are presented.

Remember, *Incremental cost* is the additional total cost incurred for an activity & *Differential cost* is the difference in total cost between two alternatives. Sometimes these terms are used interchangeably in practice. Similarly incremental revenues and differential revenues can be defined in terms of revenue.

Opportunity cost is the contribution to operating income that is foregone or rejected by not using a limited resource in its next-best alternative use. It is the prospective change in cost following the adoption of an alternative machine, process, raw materials, specification or operation. The lost opportunity is a cost that the manager must take into consideration when making a decision. For example, the (relevant) cost of going to school for an CA degree is not only the cost of tuition, books, etc. but also the income forgone (opportunity cost) by studying rather than working.

Quantitative & Qualitative Relevant Information:

Quantitative factors are outcomes that are measured in numerical terms. Some quantitative factors are financial; they can be measured numerically, they can be expressed in monetary terms. Examples include cost of direct materials, direct labour, etc. Other quantitative factors are non-financial; they can be measured numerically, but they are not expressed in monetary terms. E.g. Increase in on time delivery from a production process, reduction in customer waiting time from a decision to invest in additional cash dispensing machine, reduction in the number of units of defective output delivered to customers arising from an investment in quality inspection, reduction in new product-development time for a manufacturing company, % of on-time flight arrivals for an airline company, etc.

Qualitative factors are outcomes that are difficult to measure accurately in numerical terms. E.g. Employee Morale, loss of customer's goodwill, etc.

Relevant Costs and Relevant Revenues

Relevant costs are expected future costs and relevant revenues are expected future revenues that differ among the alternative courses of action being considered. Be sure you understand that to be relevant costs and relevant revenues they must

- ☐ **Occur in the future**-every decision deals with selecting a course of action based on its expected future results; and
- ☐ **Differ among the alternative courses of action**-costs and revenues that do not differ will not matter and, hence will have no bearing on the decision being made.

Examples of costs which are not relevant are past expenditures on capital, depreciation of capital assets, accounting gains or losses on the sale of assets, and sunk costs of any type. **Sunk costs** are costs made as a result of a prior decision and are not relevant to the current decision as they cannot be altered by it. Unfortunately, accounting profits or losses on asset disposal result from the comparison of the sunk cost involved in its purchase (less any depreciation) as compared to the revenue generated by disposal. The prospect of accounting losses on disposal of an asset are often enough to discourage a manager from making a beneficial decision to replace the asset. Idle or unused capacity also has no value in a relevant cost decision since capacity already exists due to prior decisions and will continue to exist even it remains unused. Shared facilities or production processes are not relevant where the process would occur regardless of the number of intermediate products produced (greater than one).

Remember, Expenses incurred on conducting a market survey to assess the potential market or associated with research and development activities well before the product is considered for introduction are sunk costs for a product. Further, labour payment on piece rate system is always relevant, since there is no question of payment on idle time in such cases.

Exemplification of Difference among Relevant cost, Irrelevant costs & Sunk cost:

Particulars	Alternative I	Alternative II
	Rs.	Rs.
Direct material cost / unit	10	10
Direct labour cost / unit	05	04
Depreciation on special machinery ¹	50,000 p.a.	50,000 p.a.
Salary of Company's CEO/CFO	1 crore	1 crore
Depreciation on Office Furniture	1 lac	1 Lac

¹ Special machinery will be purchased only if we opt any of the two alternatives.

In the above case, the direct labour cost (variable cost) gets changed under both alternatives, hence it is **relevant** to the decision as to whether we follow Alt. I or Alt. II.

The direct material cost (variable cost) remains constant under both alternatives, hence it is **irrelevant** to the decision as to whether we follow Alt. I or Alt. II. It will not incur if we don't opt any of the two alternatives.

Depreciation on special machinery (fixed cost) remains constant under both alternatives, hence it is **irrelevant** to the decision as to whether we follow Alt. I or Alt. II. It will not incur if we don't opt any of the two alternatives.

Depreciation of Office Furniture & Salary of Company's CEO/CFO (fixed cost) remains constant even if none of the alternatives are followed, hence although it is irrelevant to the decision but is known as **Sunk cost**.

Question 1: "Sunk cost is irrelevant in decision-making, but irrelevant costs are not sunk costs". Explain with example. (4 Marks) May/06

Ans.: Sunk costs are costs that have been created by a decision made in the past and that cannot be changed by any decision that will be made in the future. For example, the written down value of assets previously purchased are sunk costs. Sunk costs are not relevant for decision making because they are past costs.

But not all irrelevant costs are sunk costs. For example, a comparison of two alternative production methods may result in identical direct material costs for both the alternatives. In this case, the direct material cost will remain the same whichever alternative is chosen. In this situation, though direct material cost is the future cost to be incurred in accordance with the production, it is irrelevant, but, it is not a sunk cost.

Question 2: Explain with one example each that sun cost is irrelevant in making decisions, but irrelevant costs are not sunk costs. (2 Marks) May/01

Question 3: Briefly explain the concept of 'Opportunity Costs'. (Nov 1996)

Question 4: What are incremental costs and sunk costs? Discuss. (Nov 1998)

Question 5: What are relevant costs? Identify two common pitfalls in relevant cost analyse. (Nov 1998)

Question 6: Distinguish between "Marginal cost" and 'Differential Cost'. (May 1999)

Ans.: Marginal cost represents the increase or decrease in total cost which occurs with a small change in output say, a unit of output. In Cost Accounting variable costs represent marginal cost.

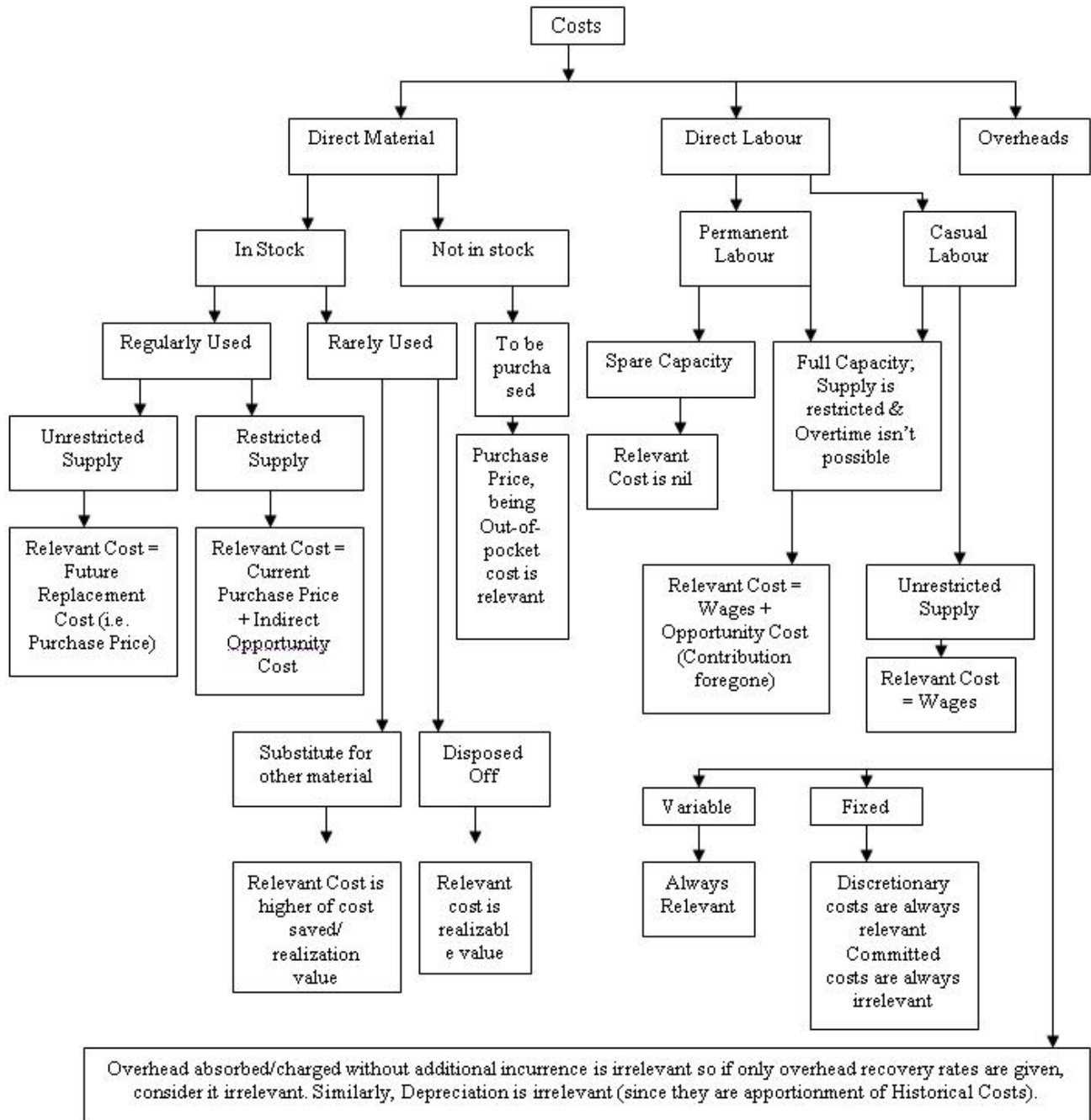
Differential cost is the change (increase or decrease) in the total cost (variable as well as fixed) due to change in the level of activity, technology or production process or method of production.

In other words, it can be defined as the cost of one unit of product or service which would be avoided if that unit was not produced or provided.

The main point which distinguishes marginal cost and differential as that change in fixed cost when volume of production increases or decreases by a unit of production. In the case of differential cost variable as well as fixed cost. i.e. both costs change due to change in the level of activity, whereas under marginal costing only variable cost changes due to change in the level of activity.

Question 7: Explain the concept of relevancy of cost by citing three examples each of relevant costs and non-relevant costs. (4 Marks) Nov./08-Old Course

Question 8: Explain the concepts of Opportunity costs and Relevant costs. (4 Marks) June/08-New Course



Case 1. Opportunity cost of material already purchased & having no other use in current production process and having no realizable value:- Suppose a concern was using till last year a particular type of material P under its production process. It has already purchased 5,000 kg. of material P during last year @ Rs.2 per kg. and placed in its godown, This material is now not used by the concern under its current production and there is no demand of this material in the market so it is decided by the management that the concern will **either** give this material to someone free of cost **or** through it away without incurring further cost and get its storage space free for other use. By chance the concern receives one offer to produce a product which will require exactly 5,000 kg. of this material P. What will be the opportunity cost of material required to be used for proposal under consideration?

Case2. Opportunity cost of material already purchased and having no other use in current production process but having realizable value:- Suppose in the above example if 5,000kg. of material P can be sold in the market @ Rs.1.25.per kg. then the opportunity cost (best alternative use) of the material for the offer under consideration will be

Case 3. Opportunity cost of material required under proposed production, only some portion thereof is held in stock out of past purchase and having no other use in current production process but having realizable value:- Suppose there is an offer to manufacture a particular product which will require 12,000 kg. of material P. It is currently available in the market @ Rs.3 per kg. If the concern has already purchased 5,000 kg. of material P during last year @ Rs.2 per kg. and placed in its godown . This material is now not used by the concern under its current production process, and this 5,000 kg. of material P can be sold in the market @ Rs.1.25 per kg. What will be the opportunity cost of material required to be used for proposal under consideration?

Case 4. Opportunity cost of material already purchased & held in godown and having regular use in current production process:- Suppose a concern uses material X in its routine production. During the last year it purchased material in bulk quantity @ Rs.7 per kg. out of the aforesaid purchases 40000 kg. of material X is still in godown . The same material is now available in the market @ Rs.9 per kg. (replacement cost).There is a proposal to produce one special equipment, which requires 8,000 kg. of the aforesaid material. What will be the opportunity cost of material required to be used for proposal under consideration?

Case 5. Opportunity cost of material already purchased and can be used in regular production as a substitute material:- Suppose there is a proposal under consideration which require 5,000 kg. of material A. During the last year the concern purchased material A in bulk quantity @ Rs.7 per kg. Out of the aforesaid purchase 11,000 kg. of material A is still in godown. If this material is not used for the proposal under consideration it can be used in place of 5,000 kg. of a substitute material Z which is in regular use. The current replacement cost of material Z is Rs.8 per kg. What will be the opportunity cost of material required to be used for proposal under consideration?

Case 6. Opportunity cost of material already purchased & having no other use in current production process and having no realizable value but can be disposed by incurring some additional cost:- Suppose a concern was using till last year a particular type of material P under its production process which is of highly toxic nature. It has already purchased 5,000 kg. of material P during last year @ Rs.2 per kg. and placed in its godown. This material is now not used by the concern under its current production and it can be disposed of by incurring an additional cost of Rs.500. By chance the concern receives one offer to produce a product which will require exactly 5,000 kg. of this material P. What will be the opportunity cost of material required to be used for proposal under consideration?

Case 7. Opportunity cost of material already purchased , then can be used after suitable alteration in place of other material or can be disposed off:- Suppose there is an proposal under consideration which require 5,000 kg. of material A. During the last year the concern purchased material A in bulk quantity

@ Rs.10 per kg. Out of the aforesaid purchases 5,000 kg. of material A is still in godown. If this material is not used for the proposal under consideration it can be used after suitable alteration in place of 5,000 kg. of material B which is in regular use. The current replacement cost of material B is Rs.8 per kg. The alteration cost of material A to be used in place of material B is Rs.2 per kg. and current resale value of material A is Rs.4 per kg. What will be the opportunity cost of material A required to be used for proposal under consideration?

Value under alternative 1.

Value under alternative 2

Question 9: X Ltd. has been approached by a customer who would like a special job to be done for him and is willing to pay Rs. 22,000 for it. The job would require the following materials

Material	Total units required	Units already in stock	Book value of units in stock Rs./unit	Realizable value Rs./unit	Replacement cost Rs./unit
A	1,000	0	-	-	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

- Material B is used regularly by X Ltd. and if stocks were required for this job they would need to be replaced to meet other production demand.
- Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of Material E, which currently cost Rs. 5 per unit (of which the company has no units in stock at the moment).

What are the relevant costs of material, in deciding whether or not to accept the contract?

Assume all other expenses on this contract to be specially incurred beside the relevant cost of material are Rs.550.

[Ans.: Total Relevant Cost is Rs. 16000; Contract should be accepted since offer is for Rs. 22000 in relation to relevant cost of Rs. 16000]

Question 10: A company owns a machine which was purchased three years ago for Rs. 18,000. Depreciation based on useful life of six years with no salvage value has been recorded each year. The present written down value of equipment is Rs. 9,000. Management is considering replacing this machine with a new machine which will reduce the variable operating costs. The new machine will cost Rs. 7,000 and will have expected life of three years with no scrap value. The variable operating costs are Re. 0.30 per unit of output for the old machine and Re. 0.20 per unit for the new machine. It is expected that both the machines will be operated at their maximum capacity of 20,000 units per annum. The current disposal or sale value of the old machinery is Rs. 4,000.

Should the company retain or replace? Assume (exclusively for complicity) that Re. 1 of each inflow or outflow in year 1 is equal to Re. 1 of each outflow in, say, year 3.

[Ans.: It is beneficial to replace the equip. (Rs. 3000)]

Question 11: S Limited is engaged in manufacturing activities. It has received a request from one of its important customers to supply a product which will require conversion of material 'M', which is a non-moving item.

The following details are available:

Book value of material M	Rs. 60
Realisable value of material M	Rs. 80
Replacement cost of material M	Rs. 100

It is estimated that conversion of one unit of 'M' into one unit of the finished product will require one labour hour. At present, labour is paid at the rate of Rs. 20 per hour. Other costs are as follows:

Out-of-pocket expenses	Rs. 30 per unit
Allocated overheads	Rs. 10 per unit

The labour will be re-deployed from other activities. It is estimated that the temporary redeployment will not result in loss of contribution. The employees to be re-deployed are permanent employees of the company.

Required:

Estimate the minimum price to be charged from the customer so that the company is not worse off by executing the order. (4 Marks) Nov./07

[Ans.: Rs. 110 per unit]

Question 12: Engineers Ltd. is just ready to deliver a machine specially designed for Durables & Co. when it is learnt that the latter has gone bankrupt.

An enquiry comes from another firm, Steady Enterprises, which can accept the machine meant for Durable & Co. if certain alterations are done to suit Steady Enterprises needs and the price is attractive.

The following factors prevail:

(a) Costs incurred on the machine for Durables & Co.

Direct Material	Rs. 560000
Direct Labour	400000
Variable Overhead	140000
Fixed Overhead	300000
Fixed Selling & Dist. Overhead	1500000

Notes: If the negotiation with Steady Enterprises fails, part of the material used may be dealt with as under:

- (a) (I) Brass materials – could be sold as scrap for Rs. 100000.
- (II) Steel materials – could be sold as scrap for Rs. 26000, but to sell it as scrap some 100 hours labour will be hired at Rs. 10 per hour to bring it to saleable condition.
- (III) Balance Materials will have to be removed at a cost of Rs. 5000, but will have a 'nil' sale value.
- (b) Price quoted to Durables & Co. was 1800000.
- (c) To cater to Steady Enterprises needs, alteration cost will be:

	Department M	Department A
Direct Materials	Rs. 10000	Rs. 5000
Direct Labour	10 men for 2 months @ Rs. 3000 per man-month	6 women for 2 months @ Rs. 2000 per woman-month
Variable Overhead	20% of Direct labour cost	25% of Direct labour cost
Fixed Overhead	60% of Direct labour cost	50% of Direct labour cost

Notes: (c) (I) Materials required are already in stock and valued at cost. If the work for Steady Enterprises is not undertaken, the company has the following choice:

- Material for Department M will be used for another job.
- Material for Department A, lying as it is for some years, will remain useless unless put on quick sales for Rs. 3000.

The present market prices for the materials for M and A are Rs. 12000 and Rs. 6000 respectively.

- (II) Department M is current working at full capacity, earning a contribution of Rs. 3 towards fixed overhead and profit per Re. 1 of labour.
- (III) Department A is presently working at 40% of its capacity, but as per agreement with the Union its present work force of 24 women cannot be reduced. A worker in this department gets Rs. 2000 a month as wages. In order to utilize its labour, Department A undertakes some off-loading work for Rs. 32500 per month from a sister concern when the workload in Department A falls below 50% capacity. Variable cost associated with off-loading work is Rs. 4000 per month. The conversion work for Steady Enterprises will mean 25% additional workload for Department A for 2 months.
- (d) The pattern and specifications of the original machine could be sold to a customer for Rs. 60000.
- (e) For supervision of the job for Steady Enterprises, a temporary Supervisor would be needed for 2 months at an agreed salary of Rs. 10000. He will be a person deputed by Steady Enterprises. The company charges all indirect and supervisory salaries to fixed overhead.

(f) Durable & Co. has already made an earnest money deposit of Rs. 180000 for the machine. As per terms of the contract, this deposit stands forfeited and Engineers Ltd. is now free to treat the sum as miscellaneous income.

(g) Taxation may be ignored.

Engineers Ltd. seeks your advice for the minimum price, based on relevant costs only, for the quotation it will make to Steady Enterprises.

[Ans.: Minimum Price is Rs. 520000]

Question 13: You are the management accountant of publishing and printing company which has been asked to quote for the production of programme of the local village fair. The work would be carried out in addition to the normal work of the company. Because of existing commitments, some weekend working would be required to complete the printing of the programme. A trainee accountant has produced the following cost estimate based upon the resource required as specified by the production manager:

Direct Material	- paper (book value)	Rs. 5000
	- inks (purchase price)	2400
Direct Labour	- skilled 250 hours @ Rs. 4.00	1000
	- unskilled 100 hours @ Rs. 3.50	350
Variable Overhead	350 hours @ Rs. 4.00	1400
Printing press depreciation	200 hours @ Rs. 2.50	500
Fixed production costs	350 hours @ Rs. 6.00	2100
Estimated department cost		<u>400</u>
		13150

You are aware that considerable publicity could be obtained for the company if you are able to win this order and the price quoted must be very competitive.

The following notes are relevant to the cost estimate above:

- (1) The paper to be used is currently in stock at a value of Rs. 5000. It is of an unusual colour which has not been used for some time. The replacement price of paper is Rs. 8000, whilst the scrap value of that in stock is Rs. 2500. The production manager does not foresee any alternative use for the paper if it is not used for the village fair programmes.
- (2) The inks required are not held in stock. They would have to be purchased in bulk at a cost of Rs. 3000. 80% of the ink purchases would be used in printing the programmes. No other use is foreseen for the remainder.
- (3) Skilled direct labour is in short supply, and to accommodate the printing of the programmes, 50% of the time required would be worked at weekends for which a premium of 25% above the normal hourly rate is paid. The normal hourly rate is Rs. 4.00 per hour.
- (4) Unskilled labour is presently under-utilised, and at present 200 hours per week are recorded as idle time. If the printing work is carried out at weekend, 25 unskilled hours would have to occur at this time, but the employees concerned would be given two hours time off (for which they would be paid) in lieu of each hour worked.
- (5) Variable overhead represents the cost of operating the printing press and binding machines.
- (6) When not being used by the company, the printing press is hired to outside companies for Rs. 6.00 per hour. This earns a contribution of Rs. 3.00 per hour. There is unlimited demand for this facility.
- (7) Fixed production costs are those incurred by and absorbed into production, using an hourly rate based on budgeted activity.
- (8) The cost of estimating department represents time spent in discussions with the village fair committee concerning the printing of its programme.

Required:

- (a) Prepare a revised cost estimate using the opportunity cost approach, showing clearly minimum price that the company should accept for the order. Give reasons for each resource valuation in your cost estimate.
- (b) Explain why contribution theory is used as a basis for providing information relevant to decision making.
- (c) Explain the relevance of opportunity costs in decision making.

[Ans.: Revised Cost Estimate: Rs. 8625]

Question 14: A research project, to date, has cost a company Rs 250000 and is under review. It is anticipated that, should the project be allowed to proceed, it will be completed in about one year and can be sold for Rs 400000. The following additional information is available:

- (i) Materials have just been received for Rs 60000. These are extremely toxic, and if not used in the project, have to be disposed of by special means at Rs 15000.

- (ii) Labour: Rs 75000. The men are highly skilled. If they are released from the Research Project, they may be transferred to the Works Department of the company and consequently the sales could increase by Rs 150000. the accountant estimated that the prime cost of those sales would be Rs 100000 and the overhead absorbed (all fixed) would amount to Rs 25000.
- (iii) Research staff: Rs 160000. A decision has already been taken that this will be the last major piece of research undertaken and consequently, when work on the project ceases, the staff involved will be made redundant. Redundancy and severance pay have been estimated at Rs 25000.
- (iv) Share of General Building expense: Rs35000.

The Managing Director is not sure what is included in this amount, but the accounts staff charge similar amounts each year to each department.

You are required to advise whether the project should be allowed to proceed and explain the reasons for the treatment of each of the amounts above in your analysis. (10 Marks) May/07

[Ans.: Project should be allowed to proceed as it will provide incremental cash inflows of Rs. 130000]

Question 15: A company manufacturing several products for regular sales has conducted a market survey at a cost of Rs 1,00,000 to introduce a new product NP. The market survey suggests that there is a demand for the sale of 1,00,000 units of NP at Rs. 18 each for one year.

The following information has been furnished by the company:

- (i) Raw Materials: Each article of NP requires one unit of each of the three types of the raw materials namely A, B, and C. Material A is in regular use of the company and the stock are replaced as and when exhausted. Material B is not in regular use of the company but as a result of overbuying in an earlier contract, the company at present holds a stock of 60,000 units. Material C is used only in NP and hence the company has to purchase the same as per the requirement of production of the new product. The data relating to three the items of raw materials are as under:

Raw Material	Current Stock (units)	Cost per unit of raw material		
		Original cost (Rs.)	Current replacement (Rs)	Current resale cost (Rs)
A	1,00,000	2.00	2.50	1.75
B	60,000	3.50	3.00	1.00
C	-	-	6.00	5.00

- (ii) Direct labour: NP requires for each article:
Skilled labour 0.25 hours at Rs. 3 per hours and unskilled labour 2 hours at Rs. 2 per hour. Due to shortage to skilled labour, the company has, in the event of deciding to take up the production of NP, to divert the skilled labour from some other product which earns a contribution of Rs. 2 per hour of skilled labour. The company has a surplus of 3,00,000 hours of unskilled labour for which payment is being made one time basis as per contract and it is not possible to terminate these surplus workers.
- (iii) Additional Staff required for the manufacture of NP:
One foreman at Rs 36,000 p.a.
One supervisor at Rs. 24,000 p.a.
- (iv) Machines: Two machines namely Machine Type P and Machine Type Q are required to produce NP. Machine Type P is in regular use on the other products also and Machine Type Q is now idle. If NP is not produced machine Type Q can be sold immediately. The relevant data relating to each type of machine are as under:

Particulars	(Rs)	
	At the start of the year	At the close of the year
Type P – Replacement cost	1,60,000	1,30,000
Resale value	1,20,000	94,000
Type Q – Replacement cost	26,000	18,000
Resale value	22,000	17,000

The company charges depreciation on Straight Line Basis.

- (v) Overheads:

Fixed overheads of the company Rs 18,00,000 per annum. Variable overheads Rs. 1.50 per unit of the new product NP.

Using the concept of relevancy of costs, prepare a Cost Sheet to show the cost per unit of the new product NP. Substantiate the figures with necessary explanation.

[Ans.: Total Cost is Rs. 1400000 & cost per unit is Rs. 14]

Question 16: A company has been making a machine to order for a customer, but the customer has since gone into liquidation, and there is no prospect that any money will be obtained from the winding up of the company.

Costs incurred to date in manufacturing the machine are Rs. 50,000 and progress payment of Rs. 15,000 have been received from customer prior to the liquidation.

The sales department has found another company willing to buy the machine for Rs. 34,000 once it has been completed. To complete the work, the following cost would be incurred:-

- Materials these have been bought at a cost of Rs.6,000. They have no other use, and if the machine is not finished, they would be sold for scrap for Rs. 2,000.
- Further labour costs would be Rs. 8,000. Labour is in short supply, and if the machine is not finished, the work force would be switched to another job, which would earn Rs. 30,000 in revenue, and incur direct cost (not including direct labour, of Rs. 12,000 and absorbed (fixed) overhead of Rs. 8,000).
- Consultancy fees Rs. 4,000. If the work is not completed, the consultant's contract would be cancelled at a cost of Rs. 1,500.
- General overheads of Rs. 8,000 would be added to the cost of the additional work.

Should the new customer's offer be accepted? Prepare a statement showing the economics of the proposition.

May/91

[Ans.: In view of incremental profit of Rs. 11500, the offer of new customer can be accepted]

Question 17: SV Ltd manufacturing a product called FLOTAP. The company is organized into two divisions, viz, Division A and Division B.

Division A manufactures FLOTAP and Division B, which manufactures the containers, packs FLOTAP in the containers and stores them by using a special protective material called 'germicide'. The details of the expenses incurred by Division B during 2002 under:

	(Rs)
Direct material including germicide	420,000
Direct labour	3,00,000
Supervision	48,000
Maintenance of machine	21,600
Rent of a party of warehouse used	27,000
Depreciation of machinery	90,000
Miscellaneous overheads	94,500
Administration overheads apportioned to the Division	1,44,000
Total	11,45,100

PH Ltd., a company, engaged in warehousing of a variety of products approached SV Ltd. to undertake to manufacture the containers required on contract basis for a period of four years for 7,50,000 per annum and/or store the packed product for a further sum of Rs.1,50,000 per annum.

Division B uses a machine for manufacture of containers. This machine was installed four years ago at a capital cost of Rs.7,20,000 and it has a useful life of four more years. It can be currently sold at Rs.1,50,000.

Division B purchased germicide worth Rs.6,00,000 during the last year. Out of this, one-fifth was used during the last year and the cost thereof is included in the material cost of 2002. The original purchase price of germicide was Rs.3,000 per tone but, if sold now, the stock of germicide would fetch only Rs.2,400 per tone. Its current replacement cost is Rs.3,600 per tone.

Division B hired a warehouse for storage of the product for Rs.54,000 per annum. Its uses only half of the space and has taken only half the amount of rent into account. The remaining space of warehouse is idle.

If the contract for manufacture of the containers and the storage of the product, FLOTAP is given to PH Ltd. Division B will be closed down. In that event the supervisory staff will be transferred to another department. The terminal benefits to be met as regards workers will amount to Rs.45,000.

If SV Ltd. continues to store the FLOTAP and leaves the manufacture of the containers to PH Ltd. the machine in Division B will not be required and the storage space requirements cannot be dispensed with. The supervisory staff will be required to be retained in Division B and only 10% of all materials will be used. The saving on account of labour retrenchment will come to Rs.15,000 per annum. The miscellaneous overheads will be reduced by 80%.

If SV Ltd. continues to manufacture the containers and leaves the storage of FLOTAP to PH Ltd, Division B will retain the machine and the warehouse space for use. The supervisory staff will also be retained and 90%

of all materials will be required. The labour force will continue and the miscellaneous overheads will be reduced by 20%

You are required to evaluate the above three proposals on four year term basis and state your recommendations.

[Ans.: Net cash outflow in Alt. I is Rs. 165600, Alt. II is Rs. 975600 & Alt. III is Rs. 366000. All alternatives result in net cash outflow, Therefore it is in interest of SV Ltd. to continue and to manufacture containers and store them in Division B.]

Question 18: Mr. Phillips owes a gift shop, a restaurant and a lodge in Shimla. Typically he operates these only during the season period of four months in a year. For the past season the occupancy rate in the lodge was 90% and level of activity in case of gift shop and restaurant at 80%.

The relevant data for the past seasons were as under:

Particulars	Gift shop		Restaurant		Lodge	
	Amount Rs.	%	Amount Rs.	%	Amount Rs.	%
Receipts/Sales	48,000	100	64,000	100	1,80,000	100
Expenditure:						
Cost of Sales	26,400	55	35,200	55	-	-
Suppliers	2,400	5	6,400	10	14,400	8
Insurance and Taxes	1,920	4	6,400	10	36,000	20
Depreciation	2,880	6	8,000	12.5	39,600	22
Salaries	4,800	10	4,800	7.5	25,200	14
Electricity Charges	960	2	3,200	5	13,500	7.5
Total	39,360	82	64,000	100	1,28,700	71.5
Profit	8,640	18	-	-	51,300	28.5

Additional information:

- Cost of sales and supplies vary directly with the occupancy rate in case of lodge and level of activity in case of gift shop and restaurant.
- Insurance & Taxes and depreciation are for the entire period of twelve months.
- Salaries paid are for the season period except a chowkidar for the lodge who is paid for the full year at Rs.400 per month.
- Electricity charges include fixed charges of Rs.640, Rs.1,920 and Rs.9,900 for gift shop, restaurant and lodge respectively. The balance amount vary directly with occupancy rate in case of lodge and level of activity in case for the season and Rs.3,000 for the entire period of twelve months.

Mr. Phillips is interested in increasing his net income. The following two options are under his consideration:-

- To continue the operations during the season period only by inserting advertisement in newspaper thereby occupancy rate of reach 100% in case of lodge and 90% level of activity in respect of gift-shop and restaurant. The costs of advertisement are estimated at Rs.12,000.
- To continue operations throughout the entire period of twelve months comprising season period of four months and off-season period of eight months. The occupancy rate is expected at 90% and 40% during season period and off-season period respectively in case of the lodge. The room rents are bound to be reduced to 50% of the original rates during off-season period. The level of activity of gift-shop and restaurant is expected at 80% and 30% during season and off-season period respectively but 5% discount on the original rates will have to be offered during off-season period.

Which option is profitable? As a Cost Accountant would you like to suggest him any other alternative based upon the above figures which can be adopted to earn more net profit. (Use incremental revenue and differential cost approach).

Nov./93

[Ans.: By adopting the Option 1, the net increase in incremental revenue by Rs. 120 (i.e. Rs. 11000-10800) over the Option 2. Therefore, Option 1 is suggested to adopt.]

Question 19: S Ltd. is a civil engineering company based at Calcutta. Contracts are carried out under the supervision of project managers who are send out from Head Office and remain on site for the duration of the contract. The project managers recruits local labour, and arranges for plant and materials to be provided by head office.

Sometimes ago, the company successfully tendered for two contracts which have now become mutually exclusive. It is currently considering which of these to accept. Both jobs would last for 12 months.

The following information about each contract is available.

(Rs. 000)

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Particulars	Nagpur	Delhi
Contract price	170	180
Penalty Payment (this is condition of the tender, if offered the job and it is not accepted)	16	8
Materials required:		
In stores (at cost)	20	24
Contacted for	-	36
To be ordered (at current cost)	40	34
Labour required:		
Project manager's salary	10	10
Travel, lodgings etc.	4	4
Local recruitment	70	56
Head Office:		
Plant depreciation	6	6
Interest on plant	2	2
General administration	8	8

Notes:

- (1) The materials which would be used on the Nagpur job have increased in money value by 60% over their purchase cost. S Ltd. has no other use for these materials on any other contract apart from the Nagpur one, but they could be re-sold to other companies in the industry at 90% of their value. Transportation and other selling cost would further decrease the cash inflow from the sale by 16.67% of the sales price.
- (2) The materials for the Delhi job have no other obvious use, but could be sold for scrap if the contract were cancelled. The scrap value would be 10% of cost and cost of transport etc. would be paid by the scrap merchant. It is likely, however, that the material could be used next year on another contract in substitution for a different material normally costing 20% less than the cost of the materials to be used on the Delhi contract.
- (3) Local labour can be hired as and when required.
- (4) Plant is depreciated on a straight line basis, and the interest on plant charge is a nominal cost added for accounting purpose.
- (5) The two contracts would require similar plant, although more plant would be required for the Delhi than for the Nagpur job. The plant not required on the Nagpur job would be sub-contract our by Head Office for Rs.2,000 per annum.
- (6) Head Office administration costs are fixed at Rs.25,000 for the coming year. This excludes project manager's salaries.

Required:

- (i) Present the data of management in a form which will assist in making the decisions to which job to undertake. Provide notes to explain the principles which have been used in selecting the data and to support any calculations made.
- (ii) Comment on the appropriateness of the approach used in your analysis.
- (iii) List briefly any other factors which would ought to be considered before finally making the decision in this case

Question 20: ABC Ltd. produces a variety of products each having a number of components parts. Product B takes 5 hours to produce on a particular machine which is working at full capacity. B has a selling price of Rs.100 and variable cost of Rs.60 per unit. A component part X-100 could be made on the same machine in two hours at a variable cost of Rs.10 per unit. The suppliers' price for the components is Rs.25 per unit.

Required: Advise whether the company should buy the component X-100

(If necessary make suitable assumptions)

(5 Marks) May/95

[Ans.: Relevant cost (p.u.) Rs. 26 & Supplier's price (p.u.) Rs. 25. Since the supplier's price is less than relevant cost of production, therefore, it is advisable to buy X-100 from outside suppliers.]

Question 21: Soft Drinks Ltd. bottles and distributes 'Amrit' brand cold drinks. It operates its distribution division as a cost centre. Budgeted cost for the year ending 31st March, 2005 is as follows:

	(Rs)
Cash Operating Costs	21,00,000
Depreciation on Fleet of Vehicles (8X Rs.52,500)	4,20,000
Apportioned Corporate Costs	3,00,000

28,20,000

Distribution division has started operation on 1st April 2002. Each vehicle of the fleet was acquired at a cost of Rs.2,40,000 and had an estimated economic life of four years. Salvage value of each vehicle at the end of four years (March 31, 2007) was estimated at Rs.30,000.

Countrywide Distributors Ltd. which has countrywide network for the distribution of food and beverages has offered Soft Drinks Ltd. a three years distribution contract for Rs.19,50,000 each year. The contract will start on 1st April 2004.

If Soft Drinks Ltd accepts the offer, it will close down its own distribution division, and will sell the delivery vehicles. Current (April 1, 2004) disposal price of each vehicle is estimated at Rs.75,000. Soft Drinks Ltd. will avoid cash operating cost of Rs.21,00,000.

Security analysts have recommended the purchase of share of Soft Drinks Ltd., security analysts are forecasting a net profit of Rs.6,60,000 for 2004-05 as against an estimated profit of Rs.6,30,000 for 2001-02, the forecast assumes that the company will continue operation of its distribution division.

Required:

- Tabulate a comparison of all relevant cost for next three years (2004-05 to 2006-07) for the two alternatives-use of own distribution division or use of countrywide distributors. Recommend whether Soft Drinks Ltd. should accept the offer of Countrywide distributors. (11 Marks) May/95
- Why might Soft Drinks Ltd. be reluctant to accept the offer of Countrywide distributors? (8 Marks)

(Ignore Income-tax and time value of money. Wherever appropriate, suitable assumptions to be made by you)

[Ans.: Relevant Cost:	95-96	96-97	97-98
Own Dis.	2100	2100	1860
Countrywide Dis.	1350	1950	1950]

Question 22: A company manufactures two products 'AB' and 'CD' by utilizing 25% and 40% of its total capacity respectively. The cost data per unit for 2003-04 are as under:

Particulars	'AB'	'CD'
Production & sales (units)	5,000	10,000
Selling price (Rs.)	80	100
Direct material (Rs.)	10	30
Direct labour (Rs.5 per hour) (Rs.)	25	20

Variable overheads are 100% on wages. Fixed overheads for 2003-04 amounted to Rs.2,25,000.

During 2004-05, the company expects that the direct material costs will rise by 5%, the labour hourly rate will rise by 25 paise and variable overheads will continue to maintain same relationship with wages as was in 2003-04.

For the same volume of output as was in 2003-04, the selling price is to be enhanced by 5% in case of 'AB' and 4% in case of 'CD'.

The company has the following proposals for consideration of the management for 2003-04 to improve profitability:

- Utilize the balance capacity to produce 'AB' and to sell this increased production at the existing selling price of Rs.80
- Utilize the balance capacity to produce 'CD'. While doing so the efficiency will however go down by 16% on account of newly recruited labour in respect of this increased production. Fixed selling price and distribution expenses of Rs.50,000 will have to be spent to sell this additional output.
- Introduce new product 'EF' to utilize the balance capacity. One unit of 'EF' can be manufactured in 7 labour hours. Direct material will cost Rs.40 per unit. Its selling price per unit will be Rs.145. Variable overheads will maintain same ratio to wages as for other two products. To boost the sales of 'EF' special advertisement expenses of RS.30,000 will be spent.

The present allocation of 25% and 40% capacities for 'AB' and 'CD' cannot be changed and only the spare capacity is required to be used for production under aforesaid proposals.

Required:

- Present a statement of profit for 2003-04.
- Using incremental revenue and differential cost approach, find out which proposal is more profitable for 2004-05.
- Present a statement of profit for 2004-05 based on above recommendation.

[Ans.: (i) Profit Rs. 175000 (ii) Net incremental value of proposal A, B & C Rs. 129000, 125375, Rs. 137500 respectively; (iii) Total Profit Rs. 312500] (19 Marks) Nov./95

Question 23: ABC Ltd. an LPG cylinder manufacturing unit, gets an order from Oil Corporation for supply of 40,000 cylinders at the standard price of Rs.700 cylinder. Getting orders is a major problem. If an order is not executed in full for any reason not only will ABC Ltd. lose the benefit; but it stand the risk of the order quantity being reduced for the next quarter also. The cylinders are made in two halves and then welded together. The cost structure is:

Materials	12.5 kg. per half
Labour	Rs.50 per half

Welding charges and fitting charges would be Rs.30 per cylinder.

Unfortunately special steel plates are in short supply and ABC Ltd. has only stock of 500MT. Another friendly unit which has in anticipation, made bottom halves, has offered to supply 40,000 numbers. What is the maximum price ABC Ltd can pay to the unit for the bottom halves? Transportation and unloading etc. will cost Rs.5 per each half.

[Ans.: The price = Rs. 330 per bottom half. (Rs. 120000÷40000)]

Question 24: ZED Ltd. operates two shops. Product A is manufactured in Shop-1 and customer's jobs against specific orders are being carried out in Shop-2. Its annual statement of income is:

(Rs)			
Particulars	Shop-1 (Product-A)	Shop-2 (Job Works)	Total
Sales/Income	1,25,000	2,50,000	3,75,000
Material	40,000	50,000	90,000
Wages	45,000	1,00,000	1,45,000
Depreciation	18,000	31,500	49,500
Power	2,000	3,500	5,500
Rent	5,000	30,000	35,000
Heat and Light	500	3,000	3,500
Other Expenses	4,500	2,000	6,500
Total Costs	1,15,000	2,20,000	3,35,000
Net Income	10,000	30,000	40,000

The depreciation charges are for machines used in the shops. The rent and heat and light are apportioned between the shops on the basis of floor area occupied. All other costs are current expenses identified with the output in a particular shop.

A valued customer has given a job to manufacture 5,000 units of X for shop 2. As the company is already working at its full capacity, it will have to reduce the output of product A by 50%, to accept the said job. The customer is willing to pay Rs.25 per unit of X. The material and labour will cost Rs.10 and Rs.18 respectively per unit. Power will be consumed on the job just equal to the power saved on account of reduction of output of A. In addition the company will have to incur additional overheads of Rs.10,000.

You are required to compute the following in respect of this job:

- (a) Differential cost; (b) Full cost; and (c) Opportunity cost; and (d) Sunk cost.

Advise whether the company should accept the job.

(19 Marks) May/96

[Ans.: (a) Rs. 105250; (b) Rs. 162750; (c) Rs. 16750; (d) 12750. The company should not accept the job because there will be a cash disadvantage Rs. 42750]

Question 25: A Ltd. produces and markets a range of consumer durable appliances. It ensures after-sales service through X Ltd. The big appliances are serviced at customer's residence while small appliances are serviced at workshop of X Ltd.

The material supplied to X Ltd. is charged at cost at 10%. X Ltd. charges customers at 25% over the above price. For labour, the company receives 10% of the rate fixed for work done under the after-sales service agreement and 15% of the rate fixed in case of jobs not covered under the agreement from X Ltd. 60% by value of the total work undertaken by X Ltd. was for big appliances and rest accounted for small appliances during the previous year.

The company decides to carry out all or some of the work itself and has chosen one area in the first instance. During the previous year the company earned a profit of Rs.2,16,000 as detailed below from X Ltd. for the area chosen:

(Rs)		
Particulars	Material	Labour
Under after-sales service agreement	60,000	1,00,00
For jobs not covered under the agreement	20,000	36,000

The company forecasts same volume of work in that area for the ensuring period. The following three options are under consideration of the management:

- (i) To set up a local service centre to provide service for small appliances only. The existing system is to continue for big appliances.
- (ii) To set up a local service centre to provide service for big appliances only. The existing system is to continue for small appliances.
- (iii) To set up a local service centre to provide service to all appliances. The existing system then stands withdrawn.

Particulars	Option-1	Option-2	Option-3
Heat, rent light etc.	125	50	150
Management costs	108	83	150
Service staff cost	230	440	750
Transport cost	25	220	230

You are required to find out the most profitable option. (15 Marks) Nov./96

[Ans.: Profit in Option -1 Rs.(‘000) 257.6, in Option -2 Rs.(‘000) 217.4, in Option -3 Rs.(‘000) 260, hence Option 3 is most profitable.]

Question 26: ACE Ltd. has an inventory of 5,000 units of a product left over from last year’s production. This model is no longer in demand. It is possible to sell these at reduced prices through the normal distribution channels. The other alternative is to ask someone to take them on “as is where is” basis. The latter alternative will cost the company Rs.5,000.

The company produced 2,40,000 units of the product last year, when the unit costs were as under:

		(Rs)
Manufacturing Cost:		
Variable	6.00	
Fixed	1.00	7.00
Selling and Distribution Cost:		
Variable	3.00	
Fixed	1.50	4.50
Total Cost		11.50
Selling Price per Unit		14.00

Required:

Should the company scrap the items or sell them at a reduced price? If you suggest the latter, what minimum price would be recommend? (8 Marks) May/98

[Ans.: If the company can get anything more than Rs. 2 per unit, then it is worthwhile to sell the stock of 5000 units and earn an additional contribution.]

Question 27: Mahila Griha Udyog Industries is considering to supply its products-a special range of namkeens to a departmental store. The contract will last for 50 weeks, and the details are given below:

	(Rs)
Material:	
X (in stock-at original cost)	1,50,000
Y (on order-on contract)	1,80,000
Z (to be ordered)	3,00,000
Labou:	
Skilled	5,40,000
Non-Skilled	3,00,000
Supervisory	1,00,000
General Overheads	10,80,000
Total cost	26,50,000
Price offered by departmental store	18,00,000
Net Loss	8,50,000

Should the contract be accepted if the following additional information is considered?

- (i) Material X is an obsolete material. It can only be used on another product, the material for which is available at Rs.1,35,000 (Material X requires some adaptation to be used and cost Rs.27,000).
- (ii) Material Y is ordered for some other product which is no longer required. It now has a residual value of Rs.2,10,000.

- (iii) Skilled labour can work on other contracts which are presently operated by semi-skilled labour at a cost of Rs.5,70,000.
- (iv) Non-skilled labours are specifically employed for this contract.
- (v) Supervisory staff will remain whether or not the contract is accepted. Only two of them can replace other positions where the salary is Rs.35,000.
- (vi) Overheads are charged at 200% of skilled labour. Only Rs.1,25,000 would be avoidable, if the contract is not accepted.

(12 Marks) May/99

[Ans.: Since there is a net incremental cash flow of Rs. 152000 therefore, contract should be accepted]

Question 28: A company has in stock, materials K which was purchased four years ago at Rs.40,000. These materials have become obsolete and can be sold as scrap for Rs.10,000. There are two alternatives:

Alternative I

The material can be converted into a specialized product as per details given below:

Add materials AX	: 600 kg.
Direct labour	: 2000 skilled hours at Rs.6 per hour 4000 unskilled hours at Rs. 4 per hour
Advertisement	: Rs.10,000

The resultant output of 500 units can be sold at Rs.150 per unit.

Material AX is in regular use of the company. The company has 1000 kg. of AX in stock, purchased at Rs.50 per kg. Its replacement cost is Rs.70 per kg. and the re-sale value is Rs.40 per kg. Variable overheads for conversion of the entire output is Rs.2,000.

Alternative II

Material K can be used as a substitute in a regular job where it will replace the material which would otherwise have to be purchased for Rs.8,000. This job will earn a profit of Rs.6,000.

The skilled labour is in short supply and they have to be diverted from other jobs where they earn a contribution of Rs.2 per hour. Unskilled labour is surplus to the extent of 10000 hours and they are being paid under a contract which cannot be terminated.

You are required to present a statement advising as to how deal with the stock of material K.

[Ans.: It is suggested to convert the material into a specialized finished product]

Question 29: Ranka Builders has been offered a contract by Excel Ltd. to build for its five special Guest Houses for use by top management. Each Guest House will be an independent one. The contract will be for a period of one year and the offer price is Rs. one crore. In addition, Excel Ltd. will also provide 2 grounds of land free of cost for the purpose of construction. The Chief Accountant of Ranka Builders has prepared an estimate on the basis of which he has advised that the contract should not be accepted at the price offered. His estimate was as follows:

		(Rs. Lakhs)
Land (3 Grounds at Rs.20 lacks each)		60
Drawing and Design		7
Registration		10
Materials:		
Cement and Sand		6
Bricks and Tiles		4
Steel		10
Other (including interior decoration)		10
Labour		
-Skilled		12
-Unskilled		8
-Supervisor's Salary		5
Overheads General		12
Depreciation		6
Total		150

The Accountant also provides the following information:

Land: The total requirement of land is 3 grounds costing Rs.20 lakhs per ground. Excel Ltd. will provide 2 grounds free of cost.

Drawing and Design: These have already been prepared and 50% of the cost has already been incurred.

Materials:

- (i) Cement and sand are already in stock and in regular use. If used for this contract, they have to be replaced at a cost of Rs.8 lakhs.
- (ii) Bricks and tiles represent purchases made several months before for a different contract. They could be sold readily for a net Rs.5 lakhs after meeting all further expenses.

- (iii) Others: Materials worth Rs.2 lakhs relating to interior decoration are in stock for which no alternative use is expected in the near future. However, they can be sold for Rs.1 lakh.

Labour:

- (i) Skilled workers will be transferred to this project from another project. The Project Manager claimed that if the men were returned to him, he could have earned the company an additional Rs.2 lakhs in term of profits.
- (ii) The supervisor undertakes various tasks in the sites and his pay and continuity of employment will not be affected by the new contract. If the contract is taken, he will devote half of his time.

Overheads:

- (i) The equipment that would be used on the contract was bought one year before for Rs.30 lakhs and is expected to last for five years. It can also be used on other contracts and the current replacement price will be Rs.32 lakhs and in a year's time it will be Rs.25 lakhs.
- (ii) The general overheads includes both specific and observed overheads. If the contract is not undertaken, Rs.4 lakhs of the same can be avoided.

Ranka Builders has also on hand another project, which would not be executed if the contract from Excel Ltd. were to be accepted. The estimated profit on that project is Rs.10 lakhs.

In the light of information given above, you are required to indicate with reasons whether the contract from Excel Ltd. should be accepted or not. (10 Marks) Nov./99

[Ans.: Total relevant cost is Rs. 93 lacs; Contract price if Rs. 1 crore. So, the offer should be accepted.]

Question 30: B Ltd. is having a big plant where tailor-made jobs are carried out. Recently a customer has approached them for a job as per specification supplied. B Ltd. does not want to lose the customer and is ready to quote a lower price. The planning engineer was asked to prepare a material requirement as per the specifications. The cost estimates worked out as under;

(1) Steel sheets 5000 kg at Rs. 15 per kg.	Rs. 75000
(2) Steel rods 1000 kg at Rs. 10 per kg	10000
(3) Bearing hardware items, etc,	15000
(4) Employee Costs:	
Monthly rated – grade A 400 hours at Rs. 10	4000
Monthly rated – grade B 600 hours at Rs. 8	4800
(5) Overheads:	
Fabrication shop – 500 hours at Rs. 20	10000
Welding shop – 300 hours at Rs. 40	12000
Planning Engineers – 200 hours at Rs. 15	3000
Design Engineers – 100 hours at Rs. 15	1500
Total Estimated Cost	<u>135000</u>

Following additional information is available:

- (1) The stocks of steel sheets are more than sufficient and were purchased a year ago. Present market price of this item is Rs. 12 per kg.
- (2) The steel rods were purchased five years back at Rs. 10 per kg. Present purchase price is Rs. 18 per kg. This material is already declared as non-moving and can be sold in market as such at Rs. 15 per kg. or can be substituted for alloy steel rods which are presently costing Rs. 17 per kg.
- (3) The labour force is always moved from job to job depending upon urgency. It is likely that the above job, if accepted, will have to be done by grade A workers alone.
- (4) The fabrication shop is treated as profit centre. A transfer price of Rs. 20 per hour is used for charging to other shops in the workshop. The fabrication shop also done jobs for outsiders whom Rs. 25 per hour is charged. The transfer price are calculated as under:

Variable Cost per machine hour	Fabrication Rs. 7	Welding Rs. 16
Departmental Fixed Costs	6	20
Profit	7	4
Transfer Price	20	40

- (5) The hourly rates of planning/design engineers are Rs. 10 per hour. However, for outside consultancy work, it is practice to charge Rs. 15 per hour.

The management wants to have the bare minimum cost for the job so that the opportunity of getting the order is not lost.

Revise the cost estimate using the additional information. Give reasons for each of the revised figure used in your calculations.

[Ans.: Total estimated relevant costs is Rs. 109300]

Question 31: B Ltd. is a company that has, in stock materials of type XY that cost Rs.75,000, but that are now obsolete and have a scrap value of only Rs.21,000. Other than selling the material for scrap, there are only two alternative uses for them.

Alternative I: Converting the obsolete materials into a specialized product, which would require the following additional work and materials:

Material A	600 units
Material B	1,000 units
Direct Labour	
5,000 hours unskilled	
5,000 hours semi-skilled	
5,000 hours highly skilled	
Extra selling and delivery expenses	Rs.27,000
Extra advertising	Rs.18,000

The conversion would produce 900 units of saleable product and these could be sold for Rs.300 per unit.

Material A is already in stock and is widely used within the firm. Although present stocks, together with orders already planned, will be sufficient to facilitate normal activity and extra material used by adopting this alternative will necessitate such materials being replaced immediately. Material B is also in stock, but it is unlikely that any additional supplies can be obtained for some considerable time, because of an industrial dispute. At the present time Material B is normally used in the production of Product Z, which sells at Rs.390 per unit and incurs total variable cost (excluding Material B) of Rs.210 per unit. Each unit of Product Z uses to Material B. The details of Material A and B are as follows:

	Material A	Material B
Acquisition cost at the time of purchase	100 per unit	Rs.10 per unit
Net realizable value	85 per unit	Rs.18 per unit
Replacement cost	90 per unit	-

Alternative II: Adopting the obsolete materials for use as a substitute for a sub-assembly that is regularly used within the firm. Details of the extra work and materials required are as follows:

Material C	1,000 units
Direct Labour:	
4,000 hours unskilled	
1,000 hours semi-skilled	
4,000 hours highly skilled	

1,200 units of the sub-assembly are regular used per quarter at a cost of Rs.900 per unit. The adaptation of material XY would reduce the quantity of the sub-assembly purchased from outside the firm to 900 units for the next quarter only. However, since the volume purchased would be reduced, some discount would be lost and the price of those purchased from outside would increase to Rs.1,050 per unit for that quarter.

Material C is not available externally though 1,000 units required would be available from stocks; it would be produce as extra production. The standard cost per unit of Material C would be as follows:

		(Rs)
Direct labour :	6 hours unskilled labour	18
Raw materials		13
Variable overhead :	6 hours at Rs.1	6
Fixed overheads :	6 hours at Rs.3	18
		55

The wages rate and overheads recovery rates for B Ltd. are:

Variable overhead	Rs.1 per direct labour hour
Fixed overheads	Rs.3 per direct labour hour
Unskilled labour	Rs.3 per direct labour hour
Semi-skilled labour	Rs.4 per direct labour hour
Highly skilled labour	Rs.5 per direct labour hour

The unskilled labour is employed on a casual basis and sufficient labour can be acquired to exactly meet the production requirements. Semi-skilled labour is part of the permanent labour force, but the company has temporary excess supply of this type of labour at the present time. Highly skilled labour is in short supply and cannot be increased significantly in the short-term, this labour is presently engaged in meeting the demand for product L, which requires 4 hours of highly skilled labour. The contribution from the sale of one unit of product L is Rs.24.

Given the above information, you are required to present cost information advising whether the stock of Material XY should be sold, converted into a specialized product (Alternative I) or adopt for use as a substitute for a sub-assembly (Alternative II). (16 Marks) Nov./00

[Ans.: Net relevant revenue of Alternative I is Rs. 20000 and Alternative II is Rs. 12000]

Question 32: A company paid Rs.20,000 and acquired a machine on 1-10-2004. Its annual operating cost is Rs.15,000 excluding depreciation. The machine will have a five year useful life with zero terminal value. The machine was just put on trial and was used for one day when the supplier offered a different model to do the same job. The annual operating cost of the revised model is Rs.9,000 exclusive of depreciation. The new machine will cost Rs.24,000. The old machine can be sold for Rs.10,000. The cost of removal; of the old machine is Rs.2,000. The machine will also have a five year useful life with zero terminal value. Sales will be Rs.2,50,000 per annum and all other cash cost will be Rs.2,10,000 per annum regardless of the decision to change the machine. The machine is installed in a separate building and the written down value of the building is Rs.5,00,000. If this building is sold now, it will fetch Rs.10 lakhs but the company proposes to use the building for installing the machine.

You are required to explain whether each item of income or expenses or cost stated above is relevant or not in deciding on the replacement of the machine.

Question 33: A has taken a shop on lease by making a down payment of Rs.12,500. Besides, he has to pay a rent Rs.12,500 per annum. If the lease is cancelled, the initial payment of Rs.12,500 will be forfeited. He plans to use the shop for sale of ready-made garments and has estimated the income and expenditure of the shop as under for the next year:

	(Rs)
Net sales	2,50,000
Cost of goods sold	1,25,000
Wages	30,000
Rent including down payment	25,000
General expenses	37,500
Total	2,17,500
Profit	32,500

In the event of his not willing to devote his time to this business, he can sublet the shop for Rs.1,375 per month.

You are required to recalculate the profit which A will earn from running the ready-made garments shop by clearly identifying the sunk and opportunity costs.

[Ans.: Net Income is Rs. 41000]

Question 34: A company had nearly completed a job relating to construction of a specialized equipment, when it discovered that the customer had gone out of business. At this stage, the position of the job was as under:

	(Rs)
Original cost estimate	1,75,200
Cost incurred so far	1,48,500
Costs to be incurred	29,700
Progress payments received from original customer	1,00,000

After searches, a new customer for the equipment has been found. He is interested to take the equipment, if certain modifications are carried out. The new customer wanted the equipment in its original condition, but without its control device and with certain other modification. The costs of these additions and modifications are estimated as under:

Direct material (at cost)	Rs.1,050
Direct wages Dept. : A	15 man days
Dept. : B	25 man days
Variable overheads	25% of direct wages in each department
Delivery costs	Rs.1,350

Fixed overheads will be absorbed at 50% of direct wages in each department.

The following additional information is available:

- The direct materials required for the modification are in stock and if not used for modification of this order, they will be used in another job in place of materials that will now cost Rs.2,250.
- Department A is working normally and hence any engagement of labour will have to be paid at the direct wages rate of Rs.120 per man day.

- (iii) Department B is extremely busy. Its direct wages rate is Rs.100 per man day and it is currently yielding a contribution of Rs.3.20 per rupee of direct wages.
- (iv) Supervisory overtime payable for the modification is Rs.1,050.
- (v) The cost of the control device that the new customer does not require is Rs.13,500. If it is taken out, it can be used in another job in place of a different mechanism. The latter mechanism has otherwise to be bought for Rs.10,500. The dismantling and removal of the control mechanism will take one man day in department A.
- (vi) If the convention is not carried out, some of the materials in the original equipment can be used in another contract in place of materials that would have cost Rs.12,000. It would have taken 2 man days of work in department A to make them suitable for this purpose. The remaining materials will realize Rs.11,400 as scrap. The drawings, which are included as part of the job can be sold for Rs.1,500

You are required to calculate the minimum price which the company can afford to quote for the new customer as stated above. (12 Marks) May/01

[Ans.: Minimum price which the company can quote is Rs. 61975]

Question 35: A Ltd. has been offered a contract that, if accepted, would significantly increase next year's activity level. The contract requires the production of 20,000 of product X and specifies a contract price of Rs.1,000 per kg. The resources required in the production of each kg. of X include the following:

Resources per kg. of X

Labour:	
Grade 1	2 hours
Grade 2	6 hours
Material	
A	2 units
B	1 liter

Grade 1 labour is highly skilled and although currently under-utilized in the firm, it is A's policy to continue to pay Grade 1 labour in full. Acceptance of the contract would reduce the idle time of Grade 1 labour. Idle time payments are treated as non-production overheads.

Grade 2 is unskilled with a high turnover, and may be considered a variable cost.

The cost to A for each type of labour are: Grade 1 Rs.40 per hour; Grade 2 Rs.20 per hour.

The materials required to fulfill the contract would be drawn from the materials already in stock. Material A is widely used within the firm and any usage for the contract will necessitate replacement. Material B was purchased to fulfill an expected order that was not received. If, material B is not used for the contract, it will be sold.

For accounting purposes FIFO is used. The various values and costs for A and B are as follows: (Rs. p. u.)

Particulars	A	B
Book value	80	300
Replacement cost	100	320
Net realizable value	90	250

A single recovery rate for fixed factory overheads is used throughout the firm, even though some of these costs could be attributed to a particular product or department. The overhead is recovered by applying a pre-determined rate per productive labour hour. Initial estimates of next year's activity, which exclude the current contract, show fixed production overhead of Rs.60,00,000 and production labour hours of 3,00,000. Acceptance of the contract would increase fixed production overheads by Rs.22,80,000.

Variable production overheads are accurately estimated at Rs.30 per productive labour hour.

Acceptance of the contract would encroach on the resources used to produce and sale another product Y, which is also made by A Ltd. It is estimated that the sale of Y would then decrease by 5,000 units in the next year. However, this reduction in sale of Y would enable attributable fixed factory overhead of Rs.5,80,000 to be avoided. Information on Y is as follows: (Per unit)

Selling price	Rs.700
Labour Grade 2	4 hours
Materials relevant variable costs	Rs.120

Required:

Advise A Ltd. on the desirability of the acceptance of the contract purely on economic considerations. Show your calculations: (15 Marks) May/02

[Ans.: Accept the contract as the pre-tax operating income is Rs. 200000]

Question 36: A construction company has accepted contract AX and work thereon is about to begin. However, the company has received an offer for another contract BX. The company cannot, due to certain constraints, take up both the contracts simultaneously. In case the company is desirous of taking up contract BX, it can get the first contract AX rescinded upon payment of a penalty of Rs.70,000.

The following are the estimates relating to the two contracts:

		(Rs)
Particulars	Contract AX	Contract BX
Material X-in stock at original cost	54,000	-
Material Y-in stock at original cost	-	62,000
Material X-firm orders placed at original cost	76,000	-
Material X-Not yet ordered (at current cost)	1,50,000	-
Material-Z Not yet ordered (at current cost)	-	1,78,000
Labour-to be engaged and paid for	2,15,000	2,75,000
Site Management Costs	85,000	85,000
Travel and other expenses	17,000	14,000
Depreciation of Plant	24,000	32,000
Interest on Capital at 12%	12,800	16,000
Head Office expenses allocated to contracts	31,690	33,100
Total	6,65,490	6,95,100
Contract Price	7,20,000	8,80,000
Estimated Profit	54,510	1,84,900

The following additional information is available:

- Material X is not in regular use, it can be used as substitute for other materials, which are currently quoted at 10% less than the original cost of X.
- Material Y is in regular use and its price has doubled since it was purchased. Its net realizable value if sold will be its new price less 15%. It can, however, be kept in store for use in other contracts to be taken up in the next year.
- If contract AX is undertaken, a part of the plant having spare capacity can be hired out for a rental of Rs.15,000 for the period.
- It is the policy of the company to charge notional interest on the estimated working capital at 12% per annum.
- Either of two contracts can be completed by 31st March, 2003, which is the close of the company's financial year.
- Site management cost is fixed.

Required:

- (i) Using the relevancy of cost concept prepare a comparative statement to show the net benefit resulting from each contract.
- (ii) Advise the management of the company as to which of two contracts should be undertaken.

[Ans.:] (i) Expected net benefit of Contract AX Rs. 236000 and Contract BX Rs. 219000 (ii) Continue with Contract AX.] (16 Marks) Nov./02

Question 37: Star Bicycle Company, produced and sold 1,10,000 bicycles annually, under the brand name 'Smart' with a price tag Rs.899. Like all other players in the industry, Star too was running under capacity. The manufacturing cost of these cycles was material Rs.300, labour Rs.200 and Manufacturing Rs.300, 40% of the manufacturing cost was variable. General and administration expenses were 50% of labour cost.

Star has now received a proposal to sell 25,000 bicycles per year under the brand name 'Jeet' to a chain store at a price of Rs.800. The brand will be exclusive for the chain stores as they will market it as their own product. Expenditure for producing 'Jeet' will be the same as that of Star as design of 'Jeet' will exactly be same as that of 'Star' with only some cosmetic changes. To produce 'Jeet' however, Rs.6,00,000 additional fund will be required on an average. Further it estimated that sale of 'Jeet' through the chain store will reduce the sale of 'Star' by 10,000 units.

You are required to calculate the relevant cost of 'Jeet', given that the weighted average cost of capital Star Co. is 15%.

[Ans.:] Relevant Cost of 'Jeet' bicycle is Rs. 623.60]

Question 38: Asha Road Carriers is a transporting company that transports goods from one place to another. It measures quality of service in terms of :

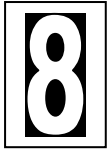
- (i) Time required to transport goods
- (ii) On-time delivery
- (iii) Number of lost or damaged cartons.

To improve its business prospects and performance the company is seriously considering to install a scheduling and tracking system, which involves an annual outlay of Rs. 1,50,000, besides equipments costing Rs. 2,00,000 needed for installation of the system. The company proposes to utilise the proceeds of the fixed deposit maturing next month to purchase the equipment. The rate of interest at present on deposit is 10%. The company furnishes the following information about its present and anticipated future performance:

	Current	Expected
On-time delivery	85%	95%
Variable costs per carton lost or damaged	Rs. 50	Rs. 50
Fixed costs per carton lost	Rs. 30	Rs. 30
Number of cartons lost or damaged	3000	1000

The company expects that each per cent point increase in on-time performance will result in revenue increase of Rs. 18,000 per annum. Contribution margin of 45% is required. Should Asha Road Carries acquire and install the new system? (11 Marks) Nov./03

[Ans.: Increase in net saving Rs. 11000, so new systems should be installed]



Decision Making

A decision model is a format method of making choice, and it often involves both quantitative and qualitative analyses. Management accountants work with managers by analyzing and presenting relevant data to guide decisions.

Incremental Costing: (CIMA's Official terminology) It is a technique used in the preparation of ad hoc information where consideration is given to a range of graduated or stepped changes in the level or nature of activity, and the additional costs and revenues likely to result from each degree of change are presented.

Remember, *Incremental cost* is the additional total cost incurred for an activity & *Differential cost* is the difference in total cost between two alternatives. Sometimes these terms are used interchangeably in practice. Similarly incremental revenues and differential revenues can be defined in terms of revenue.

Opportunity cost is the contribution to operating income that is foregone or rejected by not using a limited resource in its next-best alternative use. It is the prospective change in cost following the adoption of an alternative machine, process, raw materials, specification or operation. The lost opportunity is a cost that the manager must take into consideration when making a decision. For example, the (relevant) cost of going to school for an CA degree is not only the cost of tuition, books, etc. but also the income forgone (opportunity cost) by studying rather than working.

Quantitative & Qualitative Relevant Information:

Quantitative factors are outcomes that are measured in numerical terms. Some quantitative factors are financial; they can be measured numerically, they can be expressed in monetary terms. Examples include cost of direct materials, direct labour, etc. Other quantitative factors are non-financial; they can be measured numerically, but they are not expressed in monetary terms. E.g. Increase in on time delivery from a production process, reduction in customer waiting time from a decision to invest in additional cash dispensing machine, reduction in the number of units of defective output delivered to customers arising from an investment in quality inspection, reduction in new product-development time for a manufacturing company, % of on-time flight arrivals for an airline company, etc.

Qualitative factors are outcomes that are difficult to measure accurately in numerical terms. E.g. Employee Morale, loss of customer's goodwill, etc.

Relevant Costs and Relevant Revenues

Relevant costs are expected future costs and relevant revenues are expected future revenues that differ among the alternative courses of action being considered. Be sure you understand that to be relevant costs and relevant revenues they must

- ☐ **Occur in the future**-every decision deals with selecting a course of action based on its expected future results; and
- ☐ **Differ among the alternative courses of action**-costs and revenues that do not differ will not matter and, hence will have no bearing on the decision being made.

• **One-time-only special orders**

Question 1: A firm furnishes the following information:

Capacity in Units	Unit Cost	Unit Price
	Rs	Rs
2000	40	100
3000	35	95
4000	34	94
5000	32	-
6000	31	-

At present the firm is operating at 4000 units capacity and has received an order for 2000 units from an export market at Rs 28 per unit. Should the order be accepted? (4 Marks) May/00

[Ans.: The firm should accept the order]

Question 2: A company can produce and sell at its maximum capacity 20,000 units of a product. the sale price is Rs 100. The present sale is 15,000 units. To produce over 20,000 units and upto another 10,000 units some balancing equipments are to be installed at a cost of Rs 10 lakhs and the same will have a life span of 10 years.

The current cost structure is as under:

Direct material	30% of sale value
Direct labour	20% of sale value
Variable overheads	Rs 20 per unit
Profit	Rs 15 per unit

The present cost is estimated to go up due to price escalation as under:

10% in direct material from present level of 30%

25% in Direct labour from present level of 20%

Rs 50000 in fixed overheads per year.

There is a concrete proposal from a party to take 10000 units additionally over the present level of output on a long term basis at a unit price of Rs 90. Apart from the investment of Rs 10 lakhs, as above, the fixed overheads will increase by Rs 50000 due to additional administrative expenses.

The company is in a dilemma as to whether to accept the order for 10000 units or to use the present unused capacity of 5000 units for which there will be additional selling expenditure of Rs 50000.

Ignore financial charges and give your recommendation.

(14 Marks) Nov./98

[Ans.: Purchasing of 10000 units from a party and attaining the maximum capacity by incurring additional selling expenditure is the best proposal, because it gives maximum profit (Rs. 115000)]

Question 3: Unique Product manufactures and sells in a year 20000 units of a particular product to definite customer at a price of Rs 100 per unit. The concern has a capacity to produce 25000 units of the product per annum. To produce beyond 25000 units per annum, the concern will have to install a new equipment at a cost of Rs 15 lakhs. The equipment will have a life span of 10 years and will have no residual value. There is an offer from a client to purchase 10000 units of the product regularly at a price of Rs 90 per unit. The order, if accepted, will have to be over and above the existing level of production of 20000 units.

The cost structure is as under:

	Per Unit Rs
Direct material	30
Direct labour	20
Variable overhead	10
Profit	20

During the coming year, it has been estimated that the cost of direct material, as compared to the current year will be increased by 10%. Because of certain wage agreement direct labour cost will increase by 25%. Fixed overhead will increase by 10%. If the new order of 10000 units is accepted, fixed overhead will increase further by Rs 60000 due to increased administrative charges.

You are required to analyze whether the concern should accept the order or instead of that try to secure order for the balance unused capacity, as available now, through some sales promotion expenses which will be Rs 50000 per annum. Ignore financial charges for the new investment.

(8 Marks) May/00

[Ans.: It is advisable to produce and sell 25000 units @ Rs. 100 per unit and utilize full production capacity, as only then the profit would be maximum i.e. Rs. 310000]

• Make or Buy

Question 4: Product 'A' takes five hours to produce on a particular machine and it has a selling price of Rs 50 and a marginal cost of Rs. 35

On the same machine, another product 'B' can be made at two hours at a marginal cost of Rs 5 per unit.

Supplier's price of product 'B' is Rs 10 per unit.

Assuming that machine hour is the key factor, advice whether product 'B' could be bought out or manufactured.

(6 Marks) Nov./99

[Ans.: Product B should be bought]

Question 5: A firm needs a component in an assembly operation. If it wants to do the manufacture itself, it would need to buy a machine for Rs 4 lakhs which will last for 4 years with no salvage value. Manufacturing cost in each of the 4 year would be Rs. 6 lakhs, Rs. 7 lakhs, Rs. 8 lakhs & Rs. 10 lakhs respectively. If the firm had to buy the components from a supplier, the cost would be Rs 9 lakhs, Rs10 lakhs, 11 lakhs and Rs 14 lakhs respectively in each of the four year. However, the machine would occupy floor space which would have

been used for another machine. This latter machine would be hired at no cost to manufacture an item, the sale of which would produce net cash flows in each of the four year of Rs 2 lakhs. It is impossible to find room for both the machine and there are no other external effects. The cost of capital is 10 % and the present value factor for each of the four year is 0.909, 0.826, 0.751 and 0.683 respectively.

Should the firm make the component or buy from outside.

(10 Marks) May/99

[Ans.: There is a saving of Rs. 14800 in buying the component from outside]

Question 6: A company manufactures three components. These components pass through two of the company's departments P and Q. the machine hour capacity of each department is limited to 60000 hours in a month. The monthly demand for components and cost data are as under:

Components	A	B	C
Demand (units)	<u>900</u>	<u>900</u>	<u>1350</u>
	Rs	Rs	Rs
Direct Material/units	45	56	14
Direct labour/units	36	38	24
Variable Overheads/unit	18	20	12
Fixed overheads P @ Rs 8 per hour	16	16	12
Q @ RS 10 per hour	30	30	10
Total	145	160	72

Components A and C can be purchased from market at RS 129 each and Rs70 each respectively.

You are required to prepare a statement to show which of the components in what quantities should be purchase to minimize the cost.

(7 Marks) Nov./02

[Ans.: 250 units of component A should be purchased from outside]

Question 7: GG Ltd manufactures and sells an equipment called water purifier. The cost data for each batch of ten number of water purifier is as follows:

Components	A	B	C	D	E
Machine Hours	20	28	24	-	-
Labour Hours	-	-	-	4	2
	Rs	Rs	Rs	Rs	Rs
Variable Costs	64	108	116	24	8
Fixed Cost as Apportioned	36	52	64	26	22

Assembly cost (all variable) Rs 50 per batch.

Selling pre Rs 800 per batch

Maximum available machine capacity for making components A, B and C is 10800 hours and it con not be increased further. Labour is available for making components D and E and for assembling the product.

Estimated increase in demand next year is 50% and fixed cost in general may increase by Rs 10000.

In order to release production capacity to meet increased market demand, the company decides to purchase one of the machine made components.

Quote Ltd is the only supplier of component A, B, and C. because of incomplete records; it is unable to quote single figure prices. Its quotation is as follows:

Component	Pessim- Istic view Rs	Proba- ility Rs	most lik- ly view Rs	Proba- bility Rs	Optimist- ic view Rs	Proba- bility Rs
A	120	0.25	110	0.5	80	0.25
B	200	0.25	130	0.5	140	0.25
C	160	0.25	140	0.5	120	0.25

It is agreed between the companies that the price of each of the components will be determined on an overall basis based on information found in the quotation.

You are required to:

- Indicate, in the context of the key factor, the maximum number of batches that could be produced, if each of the three alternative namely buying A B or C is considered (8 Marks)
- Analyse the financial implication of purchase and advise which components is to be bought keeping in view the fact that production capacity will be limited to a 50% increase. (4 Marks)
- Prepare a profit statement for the period assuming that the component chosen by you is bought out and extra production is made and sold. (4 Marks) May/00

[Ans.: Purchased from outside]

- | | A | B | C |
|--|--------|--------|-----|
| (i) No. of batches produced internally (in batches) | 207.69 | 245.45 | 225 |
| (ii) Component C should be purchased from outside as it gives maximum contribution of Rs. 91,350 | | | |
| (iii) Profit on manufacturing of 225 batches Rs. 51,350] | | | |

Question 8 [Overtime and Subcontract]: A company manufactures two products P and Q. Both the products pass through the company's two departments, A and B. The market demand for a month is 2500 units of P and 2000 units of Q. The company has normal capacity of 6000 hours in department A and 520 hours in department B per month. Overtime is acceptable upto 50% of normal hours in each department. The details relating to the product are as under:

	Product	
	P	Q
Direct material cost per unit	Rs 10	5
Fixed overheads per month	Rs18000	6400

		Department	
		A	B
Direct labour time per unit (minutes)			
Product:	P	6	12
	Q	18	12
Direct wage rate per hour			
Normal time	Rs	10	12
Overtime	Rs	15	18

In the event of the company not being able to fulfill the demand for want of capacity, the balance quantity of the product can be sold by buying from a sub-contractor, who was agreed to supply product P at Rs 18 and product Q at Rs 12 per unit.

Required:

- Calculate the quantity of each product to be manufactured and/ or to be sub- contracted in a most economical way to fulfilling the market demand.
 - Present a statement showing the total cost involved in your solution in (i) above. (16 Marks) May/01
- [Ans.: Total Cost is Rs. 81305]

Question 9: P Ltd manufacture plastic can of a standard size. The variable cost per can is Rs 4 and the selling price is Rs 10 each. The factory of the company has eight machines of identical size. Any individual machine can produce 30 cans per hour. The factory works on a 300 days per annum basis and actual available hour per machine per day is 7.5. The company has an order of 420000 cans from an oil company, to supply. The yearly fixed cost of the company is Rs 20 lacs. P Ltd has received an order from another firm for supplying 60000 nos. of plastic moulded toys. The price of the toys is Rs 60 each and the variable cost is Rs 50 each. While this order would be acceptable for supplying for total quantities only, on acceptance, a special mould costing Rs 225000 would be required to be acquired to manufacture the toys. The time study exercise has revealed that 15 nos. of toys can be produced per hour by any of the machines;

Advice the company, with reasons in the following situations:

- Whether to accept the order of manufacturing moulded toys, in addition to supplying 420000 nos. of cans or not;
- Whether to accept the order manufacturing moulded toys, if the order of cans increased to 540000 nos. or not;
- While a sub- contractor is willing to supply the toys, either whole or part of the required quantities at an all inclusive rate of Rs 57.5 each, what would be the minimum excess capacity needed to justify the manufacturing of any portion of the toys order, instead of sub-contracting
- The company had an understanding that the order of the cans will be increased during the year on negotiation, and planned and manufactured 450000 cans during the year. For utilizing the excess capacity, they also accepted the toys order and sub-contracting only 15000 nos. of toys.
- At the year's end, however, it was revealed that the order of the cans could be for 480000 nos, if it was properly negotiated. How much loss has been suffered by the company due to improper prediction of demand and negotiation?

[Ans.: (i) Accept the order, increase in profit by Rs. 375000; (ii) No; (iii) 2000 excess machine hours are required; (iv) Rs. 67500]

Question 10: XYZ Ltd. is currently manufacturing 5,000 units of the product 'XY 100' annually, making full use of its machine capacity. The selling price & total cost p. u. associated with 'XY 100' are as follows

	Rs. p.u.	Rs.p.u.
Selling price		900
Cost per unit:		
Direct materials	200	
Variable machine costs @rs.100 per hr.	150	
Manufacturing overhead costs	180	
Marketing and administrative costs	<u>200</u>	<u>730</u>
Operating income per unit of 'XY 100'		<u>170</u>

XYZ Limited can sell additional 3,000 units of 'XY 100', if it can outsource those additional units. ABC Limited, a supplier of quality products, has agreed to supply upto 6,000 units of 'XY 100' per year at a price of Rs. 650 per unit delivered at XYZ's factory.

XYZ Limited can use its facility to produce an alternative product 'XY 200'. It can sell up to 12,000 units of 'XY 200' annually. Estimated selling price and total costs per unit to manufacture and sell 12,000 units of 'XY 200' are as follows:

	Rs.	Rs.
Selling price per unit	600	
Costs per unit :		
Direct materials	200	
Variable machine costs @ Rs 100 per hr.	50	
Manufacturing overhead costs	60	
Marketing and administrative costs	<u>110</u>	<u>420</u>
Operating income per unit of 'XY 200'		<u>180</u>

Other information pertaining to the operating of XYZ Limited is as follows:

(a) XYZ Limited use machine hours as the basis for assigning fixed manufacturing overhead. The fixed manufacturing overhead for the current year is Rs. 3,00,000. These costs will not be affected by the product-mix decision.

(b) Variable marketing and administrative costs per unit for various products are as follows:

Manufactured	'XY 100'	Rs. 80
Purchased	'XY 100'	Rs. 40
Manufactured	'XY 200'	Rs. 60

Fixed marketing and administrative costs for the current year is Rs. 6,00,000. These costs will not be affected by the product-mix decision.

Calculate the quantity of each product that XYZ Limited should manufacture and/or purchase to maximize operating income. Show your calculations. (16 Marks) May/02

[Ans.: Manufacture "XY 200" 12000 units; "XY 100" 1000 units; Purchase "XY 100" 6000 units]

Question 11: Panchwati Cement Ltd. produces '43 grade' cement for which the company has an assured market. The output for 2004 has been budgeted at 1,80,000 units at 90% capacity utilization. The cost sheet based on output(per unit) is as follows :

	Rs
Selling price	130
Direct material	30
Component 'EH'	9.40
Direct wages @ Rs. 7 per hour	28
Factory overhead (50%)	24
Selling and distribution overheads (75% variable)	16
Administrative overhead (fixed)	5

The factory overheads are applied on the basis of direct labour hours.

To utilize the idle capacity and to improve the profitability of the company, the following proposals were put up before the Board of Directors for consideration :

i) An order has been received from abroad for 500 units of product '53 grade' cement per month at Rs. 175 per unit. The cost data are :

Direct material Rs. 56 per unit, direct labour 10 hours per unit, selling and distribution overhead applicable to this product order is Rs. 14 per unit and variable factory overhead are chargeable on the basis of direct labour

hours.

ii) The company at present manufacture component 'EH' one unit of which is required for each unit of product '43 grade'. The cost details for 15,000 units of component 'EH' are as follows:

	Rs.
Direct materials	30,000
Direct labour	52,500
Variable overheads	25,500
Fixed overheads	33,000
Total	1,41,000

The component 'EH' however is available for purchase at the market at Rs. 7.90 per unit.

iii) In the event of company deciding to purchase the component 'EH' form market, the company has two alternative for the use of the capacity so released, which are as under :

- Rent out the released capacity at Re. 1 per hour.
- Manufacture component 'GYP' which can be sold at Rs. 8 per unit the cost data of this component for 15,000 units are:

	Rs.
Direct materials	42,000
Direct labour	31,500
Factory variable overheads	13,500
Other variable overheads	25,500
Total	1,12,500

Required:

- Prepare a statement showing profitability of the company envisaged in the budget.
- Evaluate the export order and state whether it is acceptable or not.
- Make an appraisal of proposal to manufacture component 'EH' and state whether the component 'EH' should be manufactured in the factory or purchased form the market. Assume that no alternative use of spare capacity is available.
- Evaluate the alternative use of the spare capacity and state whether to manufacture or buy the component 'EH' and if your decision is to buy the component 'EH', which of the two alternatives for the use of spare capacity will you prefer?

(16 Marks) Nov./04

[Ans.: (i) Profit Rs. 3168000 (ii) Acceptable (iii) 'EH' should be manufactured in the factory (iv) 'EH' should be purchased and 'GYP' should be manufactured.]

Question 12: (Make or buy components – Additional export order will fully utilize the capacity). A company is engaged in manufacture of an electronic gadget. It produces 24,000 such gadgets per annum. The company also manufactures 24,000 units of a component.

The department expenses per annum is as under:

Direct Materials	Rs. 38,40,000
Direct Labour	15,36,000
Indirect Labour	7,20,000
Inspection and testing	4,80,000
Lighting	40,000
Power	4,80,000
Insurance	30,000
Depreciation (fixed)	96,000
Miscellaneous fixed expenses	54,000

If the company stops manufacturing the components and buys the same from market, the saving in the department budget would be as under;

Direct Materials	20%
Direct Labour	25%
Indirect labour	20%
Inspection & testing	25%
Power	25%

The purchase price of the component is Rs. 70 each.

Required:

- State whether the company should make or buy the components.
- The company has received an offer of 12,000 units of the electronic gadget at the price of Rs. 245 each. If the offer is accepted by the company, the capacity will be fully utilized and the components have to be purchased. Should the company then make or buy the component? (Nov./84)

[Ans.: (i) Co. should make the component {Net Benefit Rs. 6 per unit} (ii) Accept Export order and buy the component (Net cash inflow Rs. 36000)]

Question 13: New Vistas Ltd. is in the midst of make or buy decision. One of the components P44E produced by the company and incorporated into another product before being sold, takes 4 hours of manufacture and its budget manufacturing cost is as under:

Direct Material	Rs. 14
Direct Labour	Rs. 12
Variable Overheads	Rs. 8
Fixed Overheads	Rs. <u>20</u>
	<u>54</u> per unit

- One of its reliable suppliers has offered to supply P44E at a guaranteed price of Rs. 50 per unit. Should the company accept the offer?
- Meanwhile a new situation has arisen. As per a recent Government Regulation, if P44E is continued to be manufactured, the company will incur additional inspection and testing charges of Rs. 56,000 per annum and this has not been included in the existed budgeted manufacturing cost of the component. In this situation, what should the company do?
- As there is an embargo in the company on additional recruitment of labour, if P44E is not manufactured, the direct labour released will be employed in increasing the production of an existing product which takes 8 hours to make and is sold for Rs. 90. Its budgeted manufacturing cost is as under:

Direct Material	Rs. 10
Direct Labour	Rs. 24
Variable Overheads	Rs. 16
Fixed Overheads	Rs. <u>40</u>
	<u>90</u> per unit
- The financial accountant is a bit perturbed. He points out the only last year, a special machine, exclusive for manufacture of P44E, was bought at the cost of Rs. 1 lakh. It cannot be resold or used elsewhere. If the production of this component is stopped, a sum of Rs. 90,000 has to be written off from the profits of the year, being the book value of the discarded machine.

What are your comments?

[Ans.: (i) Manufacture (ii) If it is proposed to manufacture more than 3500 components, then own manufacturing will be profitable. If it is less than 3500 components, then it is advised to purchase. (iii) As the limiting factor is labour hours, it is better to manufacture the another existing product and purchase the component at the guaranteed price of Rs. 50, (iv) Book cost is irrelevant cost.]

Question 14: X is a multiple product manufacturer. One product line consists of motors and the company produces three different models. X is currently considering a proposal from a supplier who wants to sell the company blades for the motors line.

The company currently produces all the blades it requires. In order to meet customer's needs, X currently produces three different blades for each motor model (nine different blades). The supplier would charge Rs. 25 per blade, regardless of blade type. For the next year X has projected the costs of its own blade production as follows (based on projected volume of 10,000 units):

Direct materials	Rs. 75,000
Direct labour	65,000
Variable overhead	55,000
Fixed overhead:	-
Factory supervision	35,000
Other fixed cost	<u>65,000</u>
Total production costs	<u>2,95,000</u>

Assume (1) the equipment utilized to produce the blades has no alternative use and no market value, (2) the space occupied by blade production will remain idle if the company purchases rather than makes the blades, and (3) factory supervision costs reflect the salary of a production supervisor who would be dismissed from the firm if blade production ceased.

- Determine the net profit or loss of purchasing (rather than manufacturing) the blades required for motor production in the next year.
- Determine the level of motor production where X would be indifferent between buying and producing the blades. If the future volume level were predicted to decrease, would that influence the decision?

(iii) For this part only, assume that the space presently occupied by blade production could be leased to another firm for Rs. 45,000 per year. How would this affect the make or buy decision?

[Ans.: (a) Loss: Rs. 20000 (b) Indifference Point is 6364 units (c) Loss: Rs. 25000] (9 Marks) June/09-OC

Question 16: Priya Gadget Ltd. specializing the household gadgets, has just perfected and test marketed a modified version of a popular gadget. It has three components X, Y, and Z one of each is required per gadget. All these components are made and assembled in its own factory and capacity utilization of the machines is full.

The modification essentially involves a special machining and fixing a new attachment for which the company has provided for double the existing production capacity to take care of possible increased demand.

The cost structure of the modified gadget is as under:

Component	Machine hours per unit	Variable cost per unit (Rs.)	Fixed cost allocated per unit (Rs.)	Total Cost (Rs.)
X	16	50	15	65
Y	24	56	20	76
Z	32	54	30	84
Special machining and assembling	-	60	45	105
		220	110	330
Selling Price				500

Since the response of the modified gadget is very good, the company would like to capture the market in ensuring year itself by increasing sales. While all the existing machines in the factory are capable of making all the components X, Y and Z, increase of machine capacity cannot be achieved/made during the budget year. However, the special machining process and capacity permits one of the components, either X, Y or Z to be brought from outside. The following offers have been received:

Component	Price per unit
X	Rs. 66
Y	Rs. 78
Z	Rs. 94

The marketing manager feels that sales can be increased by 50% during the year and with the advertisement support even by 75%.

You are required to give your recommendations as to which component should be brought from outside if production is increased by 50% and 75% respectively. (May/94)

[Ans.:
 Buy 50% increase Y 75% increase Z
 Make X & Z X & Y]

Question 15: B Ltd. produces and sells Bicycles. It also manufactures the chains for its Bicycles. It expects to produce and sell 24000 Bicycles during 1996-97. It is considering an offer from an outside vendor to supply any number of chains at Rs. 12 per chain.

The accountant of B Ltd. reports the following costs for producing 24000 chains:

Cost	Cost per unit (Rs.)	Total Cost (Rs.)
Direct Material	5.00	120000
Direct Labour	4.00	96000
Variable manufacturing overhead	2.00	48000
Inspection, set-up, etc.	1.00	24000
Machine rent	1.00	24000
Allocated fixed overhead	1.25	30000
	14.25	342000

The following additional information is available:

- Inspection, set-up, etc. vary with the number of batches in which the chains are produced. Currently chains are being produced in the batch size of 2000 units.
- Direct labour cost represents wages to four workers who are exclusively engaged in the manufacturing of chains. These workers are in permanent capacity and cannot be retrenched.
- If B Ltd. procures all its chains from outside vendor, it will not require machine which it has hired for manufacturing chains.

Required:

- (i) Assume that if B Ltd., purchases chains from outside vendor, the facility (including workers) where the chains are currently manufactured will remain idle. Should B Ltd. accept the offer from outside vendor at the anticipated production and sale volume of 24000 units?
- (ii) Whether your decision in (i) will change if facilities can be used to upgrade the bicycles which will result in incremental revenue of Rs. 22 per bicycle. The variable cost of upgrading would be Rs. 18 and tooling cost would be Rs. 16000.
- (iii) Assuming that facilities will be used as stated in (ii) above. Further, assume that with better planning, B Ltd. will be able to manufacture chains in batch size of 4000 units (instead of 2000 units) if it decides to produce chains inside.

(13 Marks) Nov./95

[Ans.: (i) Should not accept order from outside vendor, because this decision will lead to reduction in profit by Rs. 72000 (ii) Should not accept the offer of alternative use of facilities for upgrading the bicycle. It will lead to increase of Rs. 80000 in contribution. This is more than the excess of bought out price over variable and avoidable cost. (iii) If inspection cost decreases, then excess of bought-out price over variable and avoidable costs would be Rs. 84000. In comparison to this, net contribution from using the internal facilities for upgrading quality of chains will Rs. 80000. Therefore, if batch size increases and inspection cost reduces, then use of internal facilities of upgradation of quality of chain is advocated. If decision to update is taken in (ii), it will increase profit by Rs. 40000]

Question 17: A company manufacturing chemicals furnishes the following data of their activities for the year 1993-94. The company manufactures three products namely Ethylene, EDC, and VCL. Ethylene is consumed for making EDC and EDC is consumed for making VCL. One metric ton of Ethylene is required to make one metric ton of EDC and one metric ton is required for making one metric ton of VCL. The other particulars:

	Ethylene	EDC	VCL
Production capacity per annum (metric tons)	25000	30000	30000
Cost per Metric ton:			
Variable Costs	Rs. 20	Rs. 30	Rs. 40
Product Fixed Costs	20	30	40
Common Fixed Costs	10	15	20
Total	50	75	100
Selling Price per Metric Ton (Rs.)		150	300
Sales per annum (Metric tons)		10000	15000

The company restricts the manufacture of all its products only to the extent of the sales demand. The management is concerned with the low capacity utilization. In order to achieve fuller utilization of plant capacity, the company entered into negotiations with various parties. As a result of the negotiations, X who buys one-third of the current sales volume of VCL, offers to buy 20000 metric tons of VCL per annum of Rs. 250 per metric ton provided the entire quantity of 20000 metric tons is sold to him. This purchase is for the captive consumption of X and therefore will not affect the market price of VCL. X also offers to supply EDC for manufacture of VCL to the extent of 5000 metric tons at a price of Rs. 125 per metric ton. The company can also buy EDC from open market at Rs. 140 per metric ton if the order is for 10000 metric tons or more.

The bases of various costs given above are as follows:

- (i) Variable costs exclude the cost of internally consumed Ethylene in the manufacture of EDC and costs of EDC consumed in the manufacture of VCL.
- (ii) Fixed Costs are based on normal capacity production.
- (iii) The product fixed costs can be avoided only if there is nil production of the product concerned.
- (iv) Common fixed costs are to be incurred irrespective of production and sales.
- (v) No closing stocks are maintained.

You are required to: (a) Draw up a statement of profitability in respect of the year 1993-94 as originally envisaged by the company.

(b) If the company decides to accept the offer of X to buy 20000 metric tons of VCL at Rs. 250 per metric ton and if the balance quantity of production of VCL can be sold in the market show the revised statement of profitability of the company.

(14 Marks) Nov/94

[Ans.: (a) Profit Rs. 250000 (b) Profit Rs. 1050000]

Question 18: A company has a capacity of 40,000 hours per annum for manufacture of four components required for assembly of a product. The data are as under:

Components	P	Q	R	S
	Rs.	Rs.	Rs.	Rs.
Materials	64.75	47.25	43.75	77.00
Labour (Rs. 8.75 per hour)	17.50	35.00	17.50	105.00

Direct Expense	17.50	14.00	38.50	70.00
Fixed Overheads	8.75	7.00	19.25	35.00

The data relating to the number of components required per annum and the prices of the components, if purchased from the market, are as under:

	P	Q	R	S
No. of components required	2,400	4,800	1,200	2,400
Purchase price per component (Rs.)	105	103	91	294

If the company resorts to working a second shift to manufacture its requirement of components, it will increase the labour costs by 25% over normal shift. In addition the fixed costs will increase by Rs. 875 per 1,000 hours or parts thereof of second shift working.

You are required to prepare statements to show:

- Which of the components and in what quantities should be manufactured in 40,000 hours.
- Whether it will be profitable to manufacture any balance quantity of components by second shift operation.

[Ans.: (i) S-2400, P-2400, Q-1600 (ii) Second shift is not recommended]

Question 19: Agrocaps Ltd. engaged in manufacturing agricultural machinery, is preparing its annual budget for the coming year. The company has a metal pressing capacity of 20000 hours, which will be insufficient for manufacture of all requirements of components A, B, C and D.

The company has the following choices:

- Buy the components entirely from outside suppliers.
- Buy from outside suppliers and/or use a partial second shift.
- The data for the current year are given below:

Standard production cost per unit				
Component	A	B	C	D
Requirements in units	2000	3500	1500	2800
Variable Costs:	Rs.	Rs.	Rs.	Rs.
Direct materials	37	27	25	44
Direct wages	10	8	22	40
Direct expenses	10	20	10	60
Fixed overhead	5	4	11	20
Total production cost	62	59	68	164

Direct expenses relate to the use of the metal presses which cost Rs. 10 per hour to operate. Fixed overheads are absorbed as a percentage of direct wages.

Supply of all or any part of the total requirements can be obtained at the following prices, each delivered to the factory:

Component	Rs.	Component	Rs.
A	60	C	52
B	59	D	168

Second shift operations would increase direct wages by 25 per cent over the normal shift and fixed overhead by Rs. 500 for each 1000 (or part thereof) second shift hours worked.

You are required to present, with calculations:

- Which component, and in what quantities should be manufactured in the 20000 hours of press time available?
- Whether it would be profitable to make any of the balance of components required on a second shift basis instead of buying them from outside suppliers.

Nov./92

[Ans.: All requirements of D & A can be manufactured and only 600 units of product B can be manufactured. The balance requirement of product B i.e. 2900 units will have to be bought-out or manufactured in the second shift.]

Question 20: A Ltd. is a manufacturer of clothing that sells its output directly to clothing retailers. One of its departments manufactures jumpers. The department has a production capacity of 50000 jumpers. Because of liquidation of one of its major customers the company has excess capacity. For the next quarter current monthly production and sales volume is expected to be 35000 jumpers at a selling price of Rs. 40 per jumper. Expected costs and revenues for the next month at an activity level of 35000 jumpers are as follows:

Rs.	Rs.
Direct Labour	420000
Direct materials	280000
Variable Manufacturing Overheads	70000
	12
	8
	2

Manufacturing non-variable overheads	280000	8
Marketing and distribution costs	<u>105000</u>	<u>3</u>
Total Costs	1155000	33
Sales	<u>1400000</u>	<u>40</u>
Profit	<u>245000</u>	<u>7</u>

A Ltd. is expecting an upsurge in demand and considers that the excess capacity is temporary. A company in the leisure industry has offered to buy for its staff 3000 jumpers each month for the next three months at a price of Rs. 20 per jumper. The company would collect the jumpers from A Ltd.'s factory and thus no marketing and distribution cost will be incurred. No subsequent sales to this customer are anticipated. The company would require its company logo inserting on the jumper and A Ltd. has predicted that this will cost Re. 1 per jumper.

(a) Should A Ltd. accept the offer from the company?

(b) Assume labour as casual labour that are hired on daily basis. Should A Ltd. accept the offer from the company now?

(c) Assume that this special order has resulted in potential customers that are prepared to enter into a contractual agreement for a 3 year period for a supply of 15000 jumpers per month at an agreed price of Rs. 25 per jumper. The cost of inserting insignia required by each customer would remain unchanged at Re. 1 per jumper. Should it enter into contractual agreements with suppliers at Rs. 25 per jumper? If ABC does not enter into contractual agreement with the suppliers the direct labour required will be made redundant. No redundancy costs will be involved. Further, manufacturing non-variable costs of Rs. 70000 per month could be saved if a decision was made to reduce capacity by 15000 jumpers per month. Also some savings will be made in supervisory labour and support costs. Savings in marketing & distribution costs would be Rs. 20000 per month. Assume also that if the capacity was reduced factory rearrangements would result in part of the facilities being rented out at Rs. 25000 per month. Note that because variable costs vary directly with change in volume direct materials and variable manufacturing overheads will decline by 30% if capacity is reduced by 30%.

[Ans.: (a) Rs. 27000 p.m. is benefit in accepting the offer (b) Rs. 9000 p.m. is loss in accepting the offer (c) Rs. 31000 p.m is loss in accepting the order.]

Question 21: There are two alternatives (don't reorganize or reorganize) in front of strategic decision facing management at Precision Sporting Goods, a manufacturer of golf clubs. The reorganization will eliminate all manual handling of materials. The current manufacturing line uses 20 workers-15 workers operated machines, and 5 workers handle materials. The 5 materials-handling workers have been hired on contracts that permit layoffs without additional payments. Each worker puts in 2000 hours annually. Historical hourly wage rates are Rs. 14 per hour. However, a recently negotiated increase in employee benefits of Rs. 2 per hour will increase wages to Rs. 16 per hour in future. The reorganization of manufacturing operations is expected to reduce the number of workers from 20 to 15 by eliminating all 5 workers who handle materials. The reorganization is likely to have negative effects on employee morale. The cost of reorganization (consisting mostly of new equipment leases) is predicted to be Rs. 90000 each year. The predicted production output of 25000 units will be unaffected by the decision. Also unaffected will be the predicted selling price of Rs. 250, the direct material cost per unit of Rs. 50, manufacturing overhead of Rs. 750000, and marketing costs of Rs. 2000000. Should it reorganize its manufacturing operations to reduce manufacturing labour costs?

[Ans.: Reorganizing will increase predicted operating income by Rs. 70000 each year.]

Question 22: Surf Gear manufactures quality beach towels at its highly automated Burlington, North Carolina, plant. The plant has a production capacity of 48000 towels each month. Current monthly production is 30000 towels. Retail department stores account for all existing sales. Expected results for the coming month (August) are shown below (These amounts are predictions based on past costs.):

	Total	Per unit
Units Sold	<u>30000</u>	
Revenue	<u>Rs. 600000</u>	<u>Rs. 20.00</u>
Cost of goods sold (manufacturing costs)		
Variable Manufacturing costs	225000	7.50 ^b
Fixed Manufacturing costs	<u>135000</u>	<u>4.50^c</u>
Total cost of goods sold	<u>360000</u>	<u>12.00</u>
Marketing Costs		
Variable marketing costs	150000	5.00
Fixed marketing costs	<u>60000</u>	<u>2.00</u>

Total marketing costs	<u>210000</u>	<u>7.00</u>
Full costs of the product	<u>570000</u>	<u>19.00</u>
Operating Income	<u>30000</u>	<u>1.00</u>

^a Surf Gear incurs no R&D, product design, distribution or customer-service costs

^b Variable manufacturing cost per unit = Direct material cost per unit + Direct manufacturing labour cost per unit + Variable manufacturing overhead per unit
Rs. 6.00 + Re. 0.50 + Re. 1.00 = Rs. 7.50

^c Fixed manufacturing cost per unit = Fixed direct manufacturing labour cost per unit + Fixed manufacturing overhead per unit
Rs. 1.50 + Rs. 3.00 = Rs. 4.50

We assume all costs can be classified as either fixed or variable with respect to a single cost driver (units of output). As a result of a strike at its existing towel supplier, a luxury hotel chain has offered to buy 5000 towels from Surf Gear in August at Rs. 11 per towel. No subsequent sales to this hotel chain are anticipated. Fixed manufacturing costs are tied to the 48000 towel production capacity. That is, fixed manufacturing costs are tied to the production capacity available, regardless of the capacity used. If Surf Gear accepts the special order, it will use existing idle capacity to produce the 5000 towels, and fixed manufacturing costs will not change. No marketing costs will be necessary for 5000 unit one time only special order. Accepting the special order is not expected to affect the selling price or the quantity of towels sold to regular customers. Should Surf Gear accept the hotel chain's offer?

Question 23: A Company manufactures a single product, which requires two components. The company purchases one of the components from two suppliers: X limited and Y limited. The price quoted X Ltd is Rs 180 per hundred units of the component and it is found that on an average 3% of the total receipt from this supplier is defective. The corresponding quotation from Y Ltd is Rs 174 per hundred units, but the defective would go up to 5%. If the defectives are not detected, they are utilized in production causing a damage of Rs 180 per hundred units of the component.

The company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated Rs 24 per hundred units of the component. Such as inspection will be able to detect only 90% of the defective components received. No payment will be made for components found to be defective in inspection.

Required:

(i) Advise whether inspection at the point of receipt is justified?

(ii) Which of the two suppliers should be asked to supply?

(Assume total requirement is 10000 units of the component)

(10 Marks) Nov./07

[Ans.: If not inspected: Cost per 100 good component is X Ltd. Rs. 191.13, Y Ltd. Rs. 192.63; If inspected: Cost per 100 good component is X Ltd Rs. 205.86, Y Ltd. Rs. 201.30 Hence inspection is not justified. (ii) X Ltd]

Question 24: R Ltd will produce 300000 kgs of S and 600000 kgs of Y from an input of 900000 kgs of raw material Z.

The selling price of S is Rs 8 per kg and that of Y is Rs 6 per kg. Processing cost amount to Rs 54 lacs per month as under:

Raw material Z 900000 kgs	
At Rs 3 per kg	Rs 2700000
Variable processing cost	Rs 1800000
Fixed processing cost	Rs 900000
Total	5400000

There is an offer to purchase 60000 kgs of Y additional at a price of Rs 4 per kgs. The existing market for Y not be affected by accepting the offer. But the price of S is likely to be decreased uniformly at all sales.

Find the minimum reduced average price for S to sustain the increased sales. (7Marks) Nov./99

[Ans.: Rs. 7.91]

• Inventory Decisions

Formulae

1. Minimum level of inventory = Re-order level - (Average rate of consumption × lead time)

2. Maximum level of inventory = Re-order level + Re-order quantity –

(Minimum consumption × Minimum re-order period)

3. **Re-order level** = Maximum re-order period × Maximum Usage
Or
Minimum level or safety stock level + (Average or normal rate of consumption × Average time to obtain fresh supplies).
4. **Average inventory level** = Minimum + $\frac{1}{2}$ Re- order quantity
(or)
(Maximum level + Minimum level) ÷ 2
5. **EOQ** =
$$\sqrt{\frac{2 \times \text{Annul consumption (A)} \times \text{ordering cost per order (C}_o\text{)}}{\text{Carrying cost per unit per annum (C}_h\text{)}}$$
6. **Total ordering cost** = No. of order × C_o

Annual carrying or storing or holding cost = Quantity per order ÷ 2 × C_h

Total ordering & carrying cost (Known as Relevant Storing cost)

=
$$\sqrt{2 \times \text{Annul consumption} \times C_o \times C_h}$$
7. **Buffer stock** = ROL - Consumption during the lead time.
If the result is negative then it is known as Stock Out Quantity

∴ Stock out quantity = Consumption during the lead time - ROL

∴ Expected Stock out quantity = $\sum$ (Present Stock out quantity - increase in ROL)
× Probability

Stock out cost = Expected Stock out quantity × C_S (Stock-out cost p.u.)
Storing cost = Increase in stock × C_h.
8. **The best stock policy** : Select the min of annual carrying/storing/holding + total ordering cost + stock out cost. (objective minimization of total cost)

Question 25: Kartik Co. is organized into two processes. Raw material is introduced into Process A and its output becomes the raw material for Process B. The finished goods of Process B is sold in the market. Process A has a capacity to process an input of 200000 kg of raw material per annum. The normal scrap is 10% and 5% of input in Process A and Process B respectively. The realizable value of scrap is Re.1 and Rs. 2 per kg respectively for processes A and B. The operating data for a year are as under:

	Process A	Process B
Direct Wages	Rs. 2200000	2100000
Overheads	Rs. 956000	1345800

There are three suppliers of raw material whose price quotations and terms are as under:

Supplier	Price Rs./kg	Terms
P	10.00	Maximum quantity offered is 120000 kg.
Q	11.20	Maximum quantity offered is Rs. 160000 kg.
R	11.00	Rs. 11 only when the entire quantity of 200000 kg is ordered. For any quantity less than 200000 kg the price charged is Rs. 11.60 per kg

In each case, the raw material is to be collected from the supplier's factory. The variable transport cost for bringing the raw material is Rs. 1.20 per kg, Rs. 1 per kg and Re. 1 per kg for P, Q and R respectively. The annual fixed transport cost will be Rs. 200000 irrespective of the supplier from whom the material is purchased.

The output emerging from Process B can be sold to three customers at the prices and terms given below:

Customer	Price Rs./kg	Discount	Condition
K	65	2%	Maximum quantity acceptable to K is 80000 kg

L	64	2%	Maximum quantity acceptable to L is 160000 kg
M	61.80	-	Provided the entire production of the company is sold to M

In the case of customers K and L, fixed delivery costs of Rs. 5000 in total per month will be incurred. The variable delivery costs in respect of customers K and L respectively are Rs. 2.60 and Rs. 1.44 per kg. However, customer M will collect the output from the company's factory at his own cost.

Required:

1. Indicate with supporting calculations the choice of (a) Suppliers and (b) customers
2. Based on your recommendation above, prepare a statement showing the process-wise costs and profit of the company for the year.

[Ans.: Profit is Rs. 1484000]

Question 26: A company is considering the possibility of purchasing from a supplier a component it now makes. The supplier will provide the components in the necessary quantities at a unit price of Rs. 9. Transportation and storage costs would be negligible.

The company produces the component from a single raw material in economic lots of 2,000 units at a cost of Rs. 2 p.u. Average annual demand is 20,000 units. The annual holding cost is Rs. 0.25 p.u. & the buffer stock level is set at 400 units. Direct labour costs for the component are Rs. 6 per unit, fixed manufacturing overhead is charged at a rate of Rs. 3 per unit based on a normal activity of 20,000 units. The company also hires the machine on which the components are produced at a rate of Rs. 200 per month. Should the company make the component?

Question 27: The Stock Control Policy of Sakti Co. is that each stock is ordered twice a year, the quantum of each order being one-half of the year's forecast demand. The Materials manager, however, wishes to introduce a policy in which for each item of stock, Re-order Levels and EOQ is calculated.

For one of the items X, the following information is available:

Forecast Annual Demand	3600 units
Cost per unit	Rs. 100
Cost of Placing an order	Rs. 40
Stockholding Cost	20% of the average stock value
Lead Time	1 month
Buffer stock to cover fluctuation in demand	100 units

If the new policy is adopted, calculate for stock Item X, - (a) Re-order Level that would be set by the Materials manager (b) Anticipated Reduction in value of the average stock investment (c) Anticipated reduction in total inventory costs in the first and subsequent years.

(10 Marks) Nov./01

[Ans.: (a) 400 units (b) Rs. 74000 (c) Rs. 3680]

Question 28: X Ltd. presently has its inventory turnover (based on Cost of Goods Sold ÷ Average Inventory) at 10 times p.a. as compared with the industry average of 4. Average Sales are Rs. 450000 p.a. Variable Cost of Sales are 70% of Sales and Fixed Costs are Rs. 10000 per annum. Carrying Costs of Inventory (excluding financing costs) are 5% per annum. Sales force complained that low inventory levels are resulting in lost sales due to Stock-outs. The Sales manager has made an estimate based on stock-out reports as under:

Inventory Policy	Inventory Turnover	Sales
Current	10	Rs. 450000
A	8	Rs. 500000
B	6	Rs. 540000
C	4	Rs. 565000

On the basis of the above estimates and assuming a 40% tax rate and an after-tax required return of 20% on investment in inventory, which policy would you recommend.

[Ans.: Policy as its net benefit is Rs. Rs. 75034]

Question 29: The consumption pattern of a component used in an assembly is as under:

Two monthly consumption units	Probability
500	0.15
600	0.20
700	0.30
800	0.20

900

0.15

The stock out cost is Rs. 18 per unit and the two monthly holding cost is also Rs. 18 per unit. Determine the optimal safety stock.

[Ans.: Expected total cost is the lowest at a safety stock level of 100 units.]

• Subcontracting

Question 30: A company manufactures two products EXE and WYE, which pass through two of its departments exclusively used for them. A market research study conducted by the company reveals that the company can sale either 38,500 units of EXE or 31,500 units of WYE in a year. The manufacturing cost and selling price details are as under:

	EXE		WYE	
Selling price per unit		375		540
Costs:				
Department 1: Direct materials		58		100
Direct labour	5 hours	50	7.5 hours	75
Department 2: Direct materials		21		26
Direct labour	7.5 hours	90	10 hours	120
Overheads:	Department 1		Department 2	
Variable overhead rate per DLH	Rs.2.40		Rs.3.60	
Fixed overheads	Rs.5, 00,000		Rs.10, 00,000	
Budgeted direct labour hours	1,75,000		2,80,000	

Since the quantity which can be sold exceeded the production capacity, the company has been considering the use of sub-contracting production facilities. Accordingly, when tenders were floated, two contractors responded as under:

Contractor DS offers to produce up to a maximum of 17,500 units of EXE or 14,000 units of WYE in a year for the type of work done by department 1 of the company. The price charged by DS is Rs.138 per unit of EXE and Rs.212 per unit of WYE. These prices included the cost of direct materials used in department 1 of the company.

Contractor DW can produce up to a maximum of 11,200 units of EXE and 7,000 units of WYE in a year for the type of work done by department 2 of the company. The price charged by DW is Rs.150 per unit of EXE and Rs. 192 per unit of WYE. These prices included the cost of direct materials used in department 2 of the company.

Required:

(1) If the company does not wish to use the sub-contracting facility, which of the two product and in what quantity should be produced and sold by the company by using its own manufacturing capacity to earn maximum profit? Calculate the resultant maximum profit.

(2) If the company wishes to produce either 38,500 units of EXE or 31,500 units of WYE by using sub-contracting facility, state which of the two products should be produced to maximise the profits. Calculate the resultant maximum profit. (16 Marks) May/03

[Ans.: (i) EXE should be produced internally as the resultant profit earned (Rs. 25,95,000) is maximum; (ii) WYE should be produced as it yield Rs. 35,07,328 as profit]

Question 31: X Ltd has incurred losses during the past five years. Its projection for the year 2002 is also not very encouraging. The management is seriously considering the closure of the only manufacturing unit. However, it is quite open to getting the product on a sub-contracting basis and to continue its administrative and marketing functions. Currently, four product are being manufactured and sold by catering to different markets. The management is also willing to sacrifice any of these product to ensure survival.

The projection for the four products for 2002 is:

	(Rs in crores)			
	A (Rs)	B(Rs)	C(Rs)	D(Rs)
Sales	72	54	84	60
Costs:				
Material	48.0	30.0	54.0	60.0
Labour	18.0	12.0	30.0	30.0

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Allocated Overheads:

Manufacturing	6.0	4.8	7.2	4.8
Administrative & Selling	2.4	1.2	3.6	2.4
Total cost	74.4	48.0	94.8	73.2
Profit (loss)	(2.4)	6.0	(10.8)	(13.2)

The projected volume and sub-contracting charges are:

	A	B	C	D
Volume ('000 nos.)	2000	1500	3000	2000
Sub- contracting charges/unit (Rs)	80	70	90	130

Manufacturing, administrative and selling overhead consist of staff salaries, rent, essential maintenance and tax payable to the local authorities.

In case the management decides to discontinue the manufacturing operations a minimum notice period of 3 months will be required to be given to the staff as well as to the landlord of the manufacturing unit and offices. You may assume that both the manufacturing as well as the administrative and selling overheads are in fixed in nature, and that in the notice period mentioned above, these expenses would continue to be incurred.

(1) Assume that labour cost are related to the volume of operations and do not involve any notice period for discontinuance;

(2) Assume that the costs are incurred and revenues earned evenly in each of the calendar months.

Based on the above, you are required to advice the management on the best option under its consideration, viz:

- Issue notices to the staff, the landlords of manufacturing unit and offices on the first day of the year and discontinue all the operations that very day.
- Issue notices as above on the first day of the year and continue the operations till the end of the notice period. (only profitable products need to be continued).
- Issue notice to the staff and the landlord, only in the manufacturing unit, resort to sub-contracting and to continue the administrative and marketing functions, (Sub-contracting is needed to be done of profitable products only).

(17 Marks) Nov./01

[Ans.: The third option is most viable]

Question 32: PICK-n-CHOOSE Ltd has received an order from Sinha, to be executed for Rs.1,800 (all inclusive). The order requires the following materials , labour etc.

Material	Requirement	In Stock	Book value	Replacement Cost	Realisable Value
A	100 kg	50 kg	Rs.250	Rs.7 per kg	Rs.3 per kg
B	300 kg	140 kg	Rs.280	Rs.3 per kg	Rs.1 per kg

Labour : From Department 1:10 hours at Rs.15, Department 11:8 hours at Rs.12.

Variable Overhead: Rs.150

Material A is one that is regularly used by the Company and if used on this order, has to be replaced for use in other orders. Material B has no use and is the result of excessive purchases made for an order executed 2 years ago.

Labour in Department 1 is available for this order but labour in Department II is fully engaged on another order which is earning a contribution of Rs.20 per hour. If the order from Sinha is to be executed, labour in department II has to be diverted from current operations.

State whether the order received from Sinha should be accepted .Show workings.

Question 33: PRECISION TOOLINGS Ltd (PTL) entered into a contract with HOW-TO-LOSE-(HTL) for the supply of a specialized machine tool for the production of component part for Rs.27,000.A non-refundable deposit of rs.2,500 was to be paid within 10 days of the signing of the contract and this has been paid.

The estimated cost of the machine tool was: Rs.

Direct Materials	9,000
Direct Labour	5,000
Variable Manufacturing Overhead	4,000

Fixed Manufacturing Overhead	1,000
Selling & Administrative Overhead, all fixed	2,000

The machine tool was due for completion and delivery on 31st August .However in June ,HTL went into liquidation and the liquidator notified PTL that the Company was completely insolvent and would not be taking delivery of the machine tool ordered. At the point of the insolvency becoming known, the costs incurred were-

Particulars	Rs.
Materials	5,500
Labour	4,500
Variable Manufacturing Overhead	2,500
Fixed Manufacturing Overhead	1,500
Fixed Selling & Administrative Overhead	600

Two alternatives are open to PTL. Either they could sell the work done to date as scrap and also sell the designs and specifications of the original machine tool, or they could modify the machine tool and sell it to another customer, HOPEFUL MACHINERIES LTD (HML).

If the machine tool were sold as scrap-

- A portion could be sold to a scrap and metal dealer for Rs.1,900.
- Another portion could also be sold as scrap for rs.1,600 but expenses amounting to Rs.200 would be incurred in putting it into a saleable condition.
- The designs and specifications of the original machine tool could be sold for Rs.2,250.

If the machine tool was modified the following additional costs would be incurred-

Particulars	Rs
Materials	3,250
Labour	1,300
Variable Manufacturing Overhead	900
Fixed Manufacturing Overhead	1,100

The materials necessary for the modification are presently in stock. the replacement cost of the material would be Rs.3,900 and if the material were used for the modification , additional stocks would have to be bought in replacement to meet future orders.

You are required to calculate the minimum price that should be accepted from HML for the modified machine.

Question 34: Newly Started Company (NSC) Ltd is a small specialist manufacturer of electronic components and much of its output is used by the makers of aircraft for both civil and military purposes. One of the few aircraft manufacturers has offered a contract to NSC for the supply, over the next twelve months, of 400 identical components at Rs.145 each.

The data relating to the production of each component is as follows-

A. Material Requirements:

Material M 3 units. This is in continuous use by NSC. Presently 100 units are in stock at a book value of Rs.4.70 per unit .Future purchases will cost Rs.5.50 per unit.

Material P: 2 units. Presently 1,200 units of material P are held in stock. The original cost of P was Rs.4.30 per unit and the current cost is Rs.5.40 per unit .But as the material has not been required for the last two years, it has been written down to Rs.1.50 per unit scrap value. The only foreseeable alternative use of P is as a substitute for material PX 4 (in current use) but this would involve further processing costs of Rs.1.60 per unit. The current cost of material PX4 is Rs.3.60 per unit.

Part No.678-1 unit: It is estimated that this could be bought for Rs.50 each.

- Labour Requirements: Each component would require five hours of skilled labour and five hours of semiskilled labour .An employee possessing the necessary skills is available and is currently paid Rs.5 per hour. A replacement would , however, have to be obtained at a rate of Rs.4 per hour for the work which would otherwise be done by the skilled employee. The current rate for semi- skilled work is Rs.3 per hour and an additional employee could be appointed for this work.
- Overheads: ;NSC absorbs overhead by a machine rate, currently Rs.20 per hour of which Rs.7 is variable if this contract is undertaken it is estimated that fixed costs will increase for the duration of the contract by Rs.3,200.Spare machine capacity is available and each component would require four machine hours.

Required:

1. State whether or not the contract should be accepted, with appropriate figures and assumptions.
2. List three other factors which management ought to consider and which may influence their decision.
3. What would be the relevant costs of Material P if only 200 units (instead of 1,200 units) are presently in stock? Will this affect your decision in (a) above?

Question 35: Sweeties & Co. has offered Sweet-Eats & Best- items (SEBI) Ltd, an exclusive contract to supply their chain of general stores with packs of toffees, chocolates and mints for 50 weeks. The accountant of SEBI has prepared an estimate on the basis of which he has advised that the contract should not be accepted at the price offered. His estimate was as follows-

Particulars		Rs.	Rs.
Materials:	Toffees in stock at original cost	5,000	
	Chocolates already ordered, at contract cost	6,000	
	Mints to be ordered, at current price	10,000	21,000
Labour:	Four skilled-weekly wage Rs.90	18,000	
	Four un-skilled weekly wage Rs.50	10,000	
	One supervisor-half of available time	4,000	32,000
Overheads:	Depreciation	11,000	
	General	36,000	47,000
	Total Costs		1,00,000
	Price offered, Ex-works		65,000
	Loss		35,000

The Accountant also provides the following information –

1. The toffees in stock remain from a trial batch produced for a retail confectionery company that proved to be unattractive to SEBI's usual customers. They could be repackaged at a cost of Rs.900 and used to satisfy an order from another customer instead of buying in fresh supplies for Rs.4,500. Otherwise there appears to be no alternative use for them.
2. The chocolates on order represent the delivery on a contract placed several months ago. They could be sold readily for a net Rs.7,000 after meeting all further cost.
3. The skilled workers would be transferred from other work where each would be replaced by two additional unskilled trainee workers, who would each be paid rs.48 per week. The unskilled workers needed for the new contract would be an addition to the workforce.
4. The supervisor undertakes various tasks in the factory and his pay and continuity of employment will not be affected by the new contract. If it is taken, and he had to devote half of his time to it, SEBI will have to hire temporary clerical assistance at Rs.50 per week.
5. The equipment that would be used on the contract was bought five years ago for Rs.1,10,000 and was expected to last for ten years. It is now obsolete .Arrangements have already been started for it to be sold now for scrap for Rs.5,000 but they can be stopped. It will be valueless in one year's time.
6. The General OH, which are allocated at 200% of skilled labour, are all fixed costs over wide variations in output.

In the light of the information given above, comment upon the advice given by the accountant indicating with reasons whether the contract should be accepted.

Question 36: You have received a request from King Corporation to provide a quotation for the manufacture of a specialized piece of equipment. The would be a one off order, in excess of normal budgeted production. The following cost estimate has already been prepared-

Particulars		Note	In Rs.
Direct Materials Steel	10 sq.m at Rs.5 per sq.m	1	50
Brass fittings		2	20
Direct Labour Skilled	25 hours at Rs.8 per hour	3	200
Semi skilled	10 hours at Rs.5 per hour	4	50
Overheads	35 hours at Rs.10 per hour	5	350
Estimating Time		6	100
			770
Production Cost Administrative Overhead	At 20% of Production Cost	7	154

Total			924
Profit	At 25% of Total Cost	8	231
			1155

Notes:

1. The steel is regularly used, and has a current stock value of Rs.5 per square meter .There are currently 100 square meters in stock. The steel is readily available at a price of Rs. 5.50 per square meter.
2. Brass fittings would have to be bought specifically for this job, a Supplier has quoted Rs.20 for the fittings required.
3. The skilled labour is currently employed by your company and paid at a rate of Rs.8 per hour. If this job were undertaken it would be necessary either to work 25 hours overtime which would be paid at time plus one half or to reduce production of another product which currently earns a contribution of Rs.13 per hour .
4. The semi skilled labour currently has sufficient paid idle time to be able to complete this work.
5. The overhead absorption rate includes power costs which are directly related to machine usage. If this job were undertaken , it is estimated that the machine time required would be ten hours, the machine incurs power costs of Rs.2 per hour. There are no other overhead costs specifically identified with this job.
6. The cost of the estimating time is that attributed to the four hours taken by the engineers to analyze the drawings and determine the cost estimate given above.
7. It is the policy of the Company to add 20% on to the production cost as an allowance against administration costs associated with the jobs accepted.
8. This is the standard profit added by your company as part of its pricing policy.

Prepare on a relevant cost basis, the lowest cost estimate that could be used as the basis for quotation.

There may be a possibility of repeat orders from king corporation which would occupy part of the normal production capacity. What factors need to be considered before quoting for this order.

Question 37: Johnson trades as a chandler at the Savoy Marina. His profit in this business during the last year was Rs.12,000.Johnson also undertakes occasional contracts to build pleasure cruisers, and is considering the price at which to bid for the contract to build the “ Royal pleasure” for Mr. Bucknor, delivery to be in one year `s time. He has no other contract in hand, or under consideration, for at least the next few months.

Johnson expects that if he undertakes the contract he would devote one- quarter of his time to it. To facilitate this he would employ G. Harrison, an unqualified practitioner, to undertake his book-keeping and other paper work,at a cost of Rs.2,000.

He would also have to employ on the contract one supervisor at a cost of Rs11,000 and two craftsmen at a cost of Rs.8,800 each, these costs include Johnson`s normal apportionment of the fixed overheads of his business at the rate of 10% of labour cost.

During spells of bad weather one of the craftsmen could be employed for the equivalent of up to three months fulltime during the winter in maintenance and painting work in the chandler`s business. He would use materials costing Rs.1,000 .Johnson already has two inclusive quotations from jobbing builders for this maintenance and painting work one for Rs.2,500 and the other for Rs.3,500 the work to start immediately.

The equipment that would be used on the Royal Pleasure contract was bought nine years ago for Rs.21,000. Depreciation has been written off on a straight-line basis, assuming a ten- year life and a scrap value of Rs.1,000. The current replacement cost of similar new equipment is Rs.60,000 and is expected to be Rs.66,000 in one years time .Johnson has recently been offered Rs.6,000 for the equipment, and considers that in a years time he would have little difficulty in obtaining Rs.3,000 for it. The plant is useful to Johnson only for contract work.

Inorder to build the Royal Pleasure, Johnson will need six types of material, as follows.

Number of units			Price per unit (Rs)		
Material Code	In stock	Needed for the Contract	Purchases price of stock	Current Purchase Price	Current Resale Price
A	100	1,000	1.10	3.00	2.00
B	1,100	1,000	2.00	0.90	1.00
C		100		6.00	
D	100	200	4.00	3.00	2.00

E	50,000	5000	0.18	0.20	0.25
F	1,000	3000	0.90	2.00	1.00

Materials B and E are sold regularly in Johnson's business. Material A could be sold to a local sculptor, if not used for the contract. Materials A and E can be used for other purposes, such as property maintenance. Johnson has no other use for materials D and F, the stocks of which are obsolete.

The Royal Pleasure would be built in a yard held on a lease with four years remaining at a fixed annual rental of Rs.5,000. It would occupy half of this yard, which is useful to Johnson also anticipates that direct expenses, other than those noted above would be Rs.6,500.

Johnson has recently been offered a one – year appointment at a fee of Rs.15,000 to manage a boat-building firm. If he accepted the offer he would be unable to take on the contract to build Royal Pleasure, or any other contract. He would have to employ a manager to run his own business at an annual cost (including fidelity insurance) of Rs.10,000, and would incur additional personal living costs of Rs.2,000.

You are required:

1. To calculate the price at which Johnson should be willing to take on the contract in order to break even, based exclusively on the information given above.
2. To set out any further considerations which you think that Johnson should take into account in setting the price at which he would tender for the contract.

Question 38. "At Your Service" (AYS) is a large Company in the civil engineering industry with its Corporate Office in Chennai. It undertakes contracts anywhere within the state of Tamilnadu.

The Company had bid for a job in Location A and its quotation had been accepted at Rs.2,88,000. Work is due to begin in March. However, AYS has also been asked to undertake a contract in Location B. The price offered for this contract is Rs.3,52,000. Both locations A and B are within the State of Tamilnadu.

However, both contracts cannot be taken simultaneously because of constraints on staff site management personnel and on plant available. An escape clause enables the Company to withdraw from Location A contract provided notice is given before the end of November and an agreed penalty of Rs.28,000 is paid.

The following estimates have been submitted by the Company's quantity surveyor:

Cost estimates		Location A	Location B
Materials:	In stock at original cost, Material X	21,600	
	In stock at original cost, Material Y		24,800
	Firm orders placed at Original cost, Material X	30,400	
	Not yet ordered- current cost, Material X	60,000	
	Not yet ordered- current cost, Material Z		71,200
Labour	Hired Locally	86,000	110,000
Site Management		34,000	34,000
Staff Accommodation and Travel for Site Management		6,800	5,600
Plant on site – depreciation		9,600	12,800
Interest on Capital, 8%		5,120	6,400
Total Local contract Costs		2,53,520	2,64,800
Corporate Office Costs allocated at rate of 5% on total contract costs		12,676	13,240
Total Costs		2,66,196	2,78,040
Contract Price		2,88,000	3,52,000
Estimated Profit		21,804	73,960

If Machine is in regular use, we take relevant cost as the differences in replacement cost for the beginning of year and for the end of the year.

If Machine does not have any other use, we take relevant cost as the difference in realizable/resale value for the beginning of year and for the end of the year.

If material is slow moving material and it has two uses, we take better of two values (realizable value and substitution for another material).

General/Common Overhead in % form with reference to wages is not an amount incurred but amount recovered/charged which is irrelevant. If some portion of general overhead can be avoided by not taking for this work, that portion is avoidable overhead and hence relevant for the decision. In other words Fixed overhead per hour is irrelevant. Depreciation is also a fixed overhead hence if it is on per hour basis treat it as irrelevant cost.

If there is notional cost of interest in question, treat it as irrelevant. If there is actual payment of interest then

only it is relevant.

Question 39: C Ltd. an Indian company has entered into an agreement of strategic alliance with Z Inc. of United States of America for the manufacture of personal computers in India. Broadly, the terms of agreement are:

- (a) Z will provide C with Kits in a dismantled condition. These will be used in the manufacture of the personal computer in India. On a value basis, the supply, in terms of the FOB price will be 50% thereof.
- (b) C will procure the balance of materials in India.
- (c) Z will provide to C with designs and drawings in regard to the materials and supplies to be procured in India. For this, C will pay Z a technology fee of Rs. 3 crores.
- (d) Z will also be entitled to a royalty at 10% of the selling price of the computers fixed for sales in India as reduced by the cost of standard items procured in India and also the cost of imported kits from Z.
- (e) C will furnish to Z detailed quarterly returns. Other information available:
 - (i) FOB price agreed Rs. 510. Exchange rate to be adopted Rs. 1 = Rs. 40.00
[Note: In making calculations, the final sum maybe rounded to the next rupee].
 - (ii) Insurance and freight- Rs. 500 per imported kit;
 - (iii) Customs duty leviable is 150% of the CIF prices; but as a concession, the actual rate leviable has been fixed at 30% of CIF;
 - (iv) The technology agreement expires with the production of 2,00,000 computers ;
 - (v) The quoted price on kits includes a 20% margin of profits on cost to Z ;
 - (vi) The estimated cost of materials and supplies to be obtained in India will be 140% of the cost of supplies made by Z.
 - (vii) 48% of the value in rupees of the locally procured goods represent cost of the standard items.
 - (viii) Cost of assembly & other overheads in India will be Rs. 2,000 per personal computer.

Required:

Calculate the selling price of a personal computer in India bearing in mind that C has targeted a profit of 20% to itself on the selling price. (12 Marks) Nov/01

[Ans.: Selling Price per computer Rs. 43000]

Question 40: X Ltd having an installed capacity of one lakh units of a product is currently operating at 70% utilization. At current level of input price, the F.O.B. cost per unit, taking credit of applicable export incentive workout as follows:

Capacity Utilization	70%	80%	90%	100%
FOB cost per unit (Rs)	97	92	87	82

The company has received three foreign offers as under:

Sources A: 5000 units @ Rs 55 per unit FOB
 Sources B: 10000 units @ Rs 52 per unit FOB
 Sources C: 10000 units @ Rs 51 per unit FOB

Required:

Advise the company whether it should accept any or all the export orders. (10 Marks) Nov./07

[Ans.: All the 3 proposals should be accepted as they will result in a profit of Rs. 80000 and idle capacity of 5000 units.]

Question 41: AB Ltd manufacture product 'X'. The company operates a single shift of 8 hours for 300 days in a year. The capital employed in the business is Rs 18 crores. The capital employed in the business is Rs 18 crores. The manufacturing operation of the company comprises of four production departments. The company at present produces 9000 units of product 'X' at maximum capacity. However, the capacity utilization of all the four departments are not equal and the present individual capacity utilizations are as under:

Department	Capacity Utilization %
A	75

B	100
C	70
D	50

The present return on capital of the company has gone down to 10% from the earlier cut off rate of 15% due to increased cost of production.

As the company can not operate more than one shift, the management is considering two alternative proposals to increase the return on capital employed.

The two alternatives are:

Alternative I

To hire out the surplus capacity of departments A, C and D. The cost and revenue projection are as under:

Department	Hire Charges per Hour Rs.	Incremental Cost per Hour Rs.
A	2500	2000
C	1800	1500
D	1600	1200

Alternative II

To increase the installed capacity of the factory to 12000 units by adding plant and machinery in department B at a capital cost of Rs 4 crore. Any balance surplus capacity in order department after meeting the increased volume to be hired out as per alternative I. The additional units would fetch incremental revenue of Rs 1600 per unit

You are required to evaluate the two proposals and suggest to the management which of the two proposals is to be accepted. (10 Marks) May/00

[Ans.: ROI for Alternative I is 10.533% and Alternative II is 10.53%]

Question 42: P W Perfume company manufactures various qualities of perfumes and colognes. One popular line of colognes includes three products that result from a joint production process. Below are data from the most recent month of production:

Product	Sales Price	Quantity	Joint cost	Cost After Split off	Total Cost
Evergreen	Rs40	10000	Rs28	Rs20	Rs48
Morning Flower	Rs100	6000	Rs28	Rs40	Rs68
Evening Flower	Rs150	4000	Rs28	Rs50	Rs78

As the controller, you are called into the President's Office with the Director of Marketing. The President says, "I don't understand your product cost report. Either, we are selling our largest-volume product at a loss or the product cost data are all wrong. Now what is it"

Required:

- Respond to the President question.
- Another company has just introduced a product that competes directly with Morning Flower. To compete successfully with the other company's product, the price of Morning Flower cologne must be reduce to Rs 60. Should the company do so and sell blow cost.
- If P. W. Perfume Company has a policy of maintaining a gross margin of 20 per cent on sales, what would your answer be in response to the price reduction in part (ii)
- What is the minimum price for which Morning Flower can sell and still meet the 20% product gross margin for the group of products. (13 Marks) Nov./00

[Ans.: (i) Profit earned from Evergreen Rs. 83333, Morning Flower Rs. 150000 & Evening Flower Rs. 166667; (ii) The co. should sell Morning Flower below cost; (iii) A reduction in sale price would result in a loss of revenue of Rs. 140000; (iv) Minimum price per unit is Rs. 83.33]

Question 43: A manufacturing company has an installed capacity of 150000 units per annum. Its cost structure given below:

	(Per unit)
	Rs
Variable cost	10
Labour (Minimum Rs 100000 per month)	10
Overheads	4

Fixed overheads: Rs 192300 per annum

Semi-variable overheads Rs 60000 per annum at 75% capacity, which increased by 4000 per annum for every 5% increase in capacity utilization for the year as a whole.

The capacity utilization for the next year is estimated at 75% for three month, 80% for six month and 90% for the remaining part of the year. If the company is planning to have a profit of 20% on the selling price, calculate the selling price per unit (12 Marks) Nov./03

[Ans. Selling price per unit Rs. 32.90]

Question 44: Supreme Ltd, which manufactures the component EXCEL, has achieved a turnover of Rs 600000 for the calendar year 2002. The manager of the company has informed that the company has worked at the profit volume ratio of 25% and the margin of safety of 20%. But he feels due to severe competition, the selling price is to be reduced to maintain the same volume of sales for the year 2003. He does not expect any change in variable costs. He expects that due to cost reduction programme, the profit volume ratio and margin of safety will be 20% and 30% respectively and considerable saving in Fixed cost for 2003.

Even if the company prefers to shut down its operations for 2003, it expects to incur a minimum fixed cost of Rs 60000. You are expected to:

- (ii) Present the comparative statement for the year 2002 and 2003 showing under marginal costing.
- (iii) What will be minimum sales required, if it decides to shut down its unit in 2003. (11 Marks) Nov./03

[Ans.: (i) Contribution for 2002 Rs. 150000 and 2003 Rs. 112500; (ii) Rs. 93750.

Question 45: A company manufactures two products. Each product passes through two departments A and B before it becomes a finished product. The data for a year are as under:

	Product	Aristocrat	Deluxe
(i)	Maximum sales potential in units	7400	10000
(ii)	Product unit data:		
	Selling price per unit	Rs90	Rs80
	Machine hour per unit:		
	Dept. A Hours	0.50	0.30
	Dept. B Hours	0.40	0.45
(iv)	Maximum capacity of Department A is 3400 hours and of department B is 3840 hours.		
(v)	Maximum quantity of direct material available is 17000 Kg. Each product requires 2 Kg of direct materials. The purchase price of direct material is Rs 5 per Kg.		
(vi)	Variable costs are budgeted at Rs. 50 per hour for department A and Rs 60 per hour for department B.		

In view of aforesaid production capacity constraints, the company has decided to produce only one of the two products during the year under review.

Required:

- (i) Which of the two products should be produce and sold in the year under review to maximize the profit. State the number of units of that product and the resultant contribution.
- (ii) The surplus capacity available in Department A or Department B after manufacture of either Aristocrat or Deluxe is proposed to be hired out to earn a contribution of Rs. 40 per hour in the case of Department A and Rs 60 per hour in the case of department B. Prepare a statement to show whether Aristocrat or Deluxe should now be produced to maximize the total contribution. Calculate such total contribution.
- (iii) The company has been advised to produced 4250 units of each product and also to hire out to hire out the surplus capacity of Department A and/or Department B. You are required to examine the feasibility of this proposal and to prepare a budget analysis showing to total contribution for the year. (16Marks)May/04

[Ans.: (i) 8500 units of Deluxe model should be produced; (ii) Total contribution: Aristocrat Rs. 278000, Deluxe Rs. 272900; (iii) Total Contribution Rs. 264400]

Question 46: Zilmil Ltd makes two product 'Brightly' and 'Lightly'. Both the products use the same labour force, the size of which is restricted to 78000 hours per month. Brightly needs 2 hours per unit to make whereas lightly needs one hour. The estimated production and sale, manufacturing and selling expenses per month are as follows:

	Brightly		Lightly	
Production and sale (in nos.)	12000	16000	40000	48000
Cost per month (Rs)	3400000	380000	6200000	6680000
Brightly:				
Selling price per unit (Rs)	276	272	268	264
Sales demand per month	12000	14000	16000	18000
			20000	22000

The company is considering pricing option in a highly competitive market. It has estimated sales demand at various selling prices:

Brightly:						
Selling price per unit (Rs)	276	272	268	264	260	254
Sales demand per month	12000	14000	16000	18000	20000	22000

Lightly:

Selling price per unit (Rs)	163	162	161	160	154	152
Sales demand per month	40000	42000	44000	46000	48000	50000

You are required to compute profit maximizing price and quantity for each product. (11 Marks) May/06

[Ans.: Brightly-16000 units, Rs. 268 per unit; Lightly – 46000 units, Rs. 160 per unit]

Question 47: A Company manufactures two products 'X' and 'Y'. Company's fixed cost per annum is Rs 5 lacs. These products are sold for Rs 288 per unit of 'X' and Rs 432 per unit of 'Y'. Standard cost data are:

	Product 'X'	Product 'Y'
	Rs	Rs
Direct Raw Material	40	80
Direct wages Rs 8 per hour in Departments:		
1	48	72
2	24	48
3	72	-
4	-	96
Variable overhead	32	28

The company operates 8 hours shift for 300 days in a year. Number of workers engaged by each department is given below:

Department	1	2	3	4
No. of Workers	45	24	27	36

Required:

- How many units of each product should be manufactured and what is the resultant maximum profit, if number of employees can not be increased or transferred?
- If only one product is to be manufactured by the Company, which of the products would give the maximum profit and what is the amount of such profit? (11 Marks) May/06

[Ans.: (a) Product X-7200 units, Product Y-6000 units, Maximum Profit Rs. 666400; (b) Product Y-7200 units, Product X – 4800 units, Maximum Profit Rs. 623200]

Question 48: Inorganic Chemicals purchase salt and processes it into more refined product such as caustic soda, chlorine and polyvinyl chloride (PVC). For the month of October, 1998, the firm purchased salt for Rs 80000, conversion cost incurred were Rs 120000 upto the split-off point, at which time two salable products were produced: Caustic soda and chlorine. Chlorine could be further processed into PVC. Production and other relevant information for the month of October, 1998 are as follows:

	Production	Sales	Sale price per ton
Caustic soda	2400 tons	2400 tons	Rs 100
Chlorine	1600 tons	-	-
PVC	1000 tons	1000 tons	Rs 400

The full production of chlorine was further processed at an incremental cost of Rs 40000 to yield 1000 tons of PVC. There were no by-products or scrap from this further processing of chlorine. The organization did not have any opening or closing stocks of any of the above commodities for October, 1998.

There is a very active market for chlorine. The firm could have sold its entire production for October, 1998 at Rs 150 per ton.

You are required to calculate:

- How the joint cost of Rs 200000 would be allocated between caustic soda and chlorine under each of the methods, viz., (a) sales value at split-off; (b) physical measure (tons); and (c) estimate net realizable value?
- The gross margin percentage of (a) caustic soda and (b) PVC under the three methods given in (i) above.
- Daily Swimming pool Ltd. offers to purchase 1600 tons of chlorine in November, 1998 at 150 per ton. This would mean that no PVC would be produced that month. Will the acceptance of the offer affect the operating income for November, 1998? (15 Marks) Nov./98

[Ans.: Caustic Soda Chlorine

(i)	(a) Sale value at split off	240000	240000	
	(b) Sales in tons	2400	1600	
(ii)	Sale Value at split off	Physical Measure(tons)	Estimated net realizable value(Rs.)	
	(a)Caustic Soda	58.33%	50%	66.67%
	(b) PVC	65%	70%	60%

(iii) Incremental operating income (Rs. 120000)]

Question 49: CARCARE CORPORATION has just today paid for and installed a special machine for polishing cars at one of its prestigious outlets. It is the first day of the company's fiscal year. The machine cost Rs 20000. Its annual operating costs total Rs 15000 exclusive of depreciation. The machine will have a four year useful life and a zero terminal disposal value.

After the machine has been used for one day, a machine salesman walks in. he offers a different machine that promise to do the same job at a yearly operating cost of RS 9000, exclusive of depreciation. The new machine will Rs 24000 in cash, duly installed. The old machine is unique and can be sold outright for only Rs 10000 minus Rs 2000 removal cost. The new machine, like the old one, will have a four year useful life and zero terminal disposal value.

Sales, all in cash, will be Rs 150000 annually and other cash cost will be Rs 110000 annually, regardless of this decision.

For simplicity, ignore income taxes, interest and present value consideration.

Required:

- Prepare a statement of cash receipt and disbursements for each of the four years under both alternatives. What is the cumulative difference in cash flows for the four year taken together?
- Prepare income statement for each of the four years under both alternatives. Assume straight-line depreciation. What is the cumulative difference in operating income for the four year taken together?
- What are the irrelevant items in your presentations in requirements (a) and (b)?
- Suppose the cost of the old machine was Rs 100000 rather than Rs 20000. Nevertheless, the old machine can be sold outright for only Rs 10000 minus Rs 2000 removal cost. Would the net difference in requirements (a) and (b) change? Explain.
- "To avoid a loss, we should keep the old machine," What is the role of book value in decisions about replacement of machines?

(19 Marks) Nov./98

[Ans.:

	Keep Old Machine			Buy New machine		
	Year 1	2 nd , 3 rd & 4 th year each	All 4 years	Year 1	2 nd , 3 rd & 4 th year each	All 4 years
(a) Net Cash inflow	5	25	80	(5)	31	88
(b) Operating Income	20	80	13	25	88	8
(c) Purchase cost of old machine (Rs. 20000), Sale Revenue (Rs. 150000) and other cash costs (Rs. 110000).						
(d) The net difference will not change.]						

Question 50: A company produces main product "Super" and a co-product "Mild". The main product is sold entirely to its collaborator, but the product "Mild" is sold at the local market. The company increased its capacity as a result of which the output of "Mild" increased to 15000 m/t per annum at a price of Rs 1000 pt. However in the face of increased competition to sell the entire output of 15000 m/t of "Mild" the company will have to reduce the sale price by Rs 50 pt. every year for next five year and thereafter the price will at Rs 750 pt.

As an alternative the company can convert "Mild" into "Medium" at a variable cost of Rs 200 per (metric) tone. However to enter the market the sale price will have to be Rs 1200 pt in the first year and Rs 1300 pt, in the second year.

The sale of Medium will be 1000m/t in the first and there upon going up by 1000m/t each year. The company will have to invest Rs 30 lakhs in capital outlay to produce "Medium"

You are required to present the projected sales volume (quantity and value) of products "Mild" and "Medium" and also appraise the investment of Rs 30 lakhs at 12% per annum for the period of next 5 years.

Present value of Rupee one at 12% p.a.

Year	1	0.89
	2	0.79
	3	0.71
	4	0.64
	5	0.57

(11 Marks) May/00

[Ans.: The company should opt for second option as the NPV (Rs. 477.31 lacs) is better than the first option (Rs. 464.925 lacs)]

Shut Down Point:

Shut Down is a case where the business would be closed temporarily. In this case the some fixed costs will continue to incur.

$$\text{Shut Down Point (units)} = \frac{\text{Avoidable Fixed Cost} - \text{Shut Down Cost (i.e. saving in fixed cost)}}{\text{Contribution per unit}}$$

$$\text{Shut Down Point (in Rs.)} = \frac{\text{Avoidable Fixed Cost} - \text{Shut Down Cost (i.e. saving in fixed cost)}}{\text{P/V Ratio}}$$

If demand is more than calculated units we must continue the business, otherwise it is preferable to shut it down (subject to non financial considerations).

Here, Shut down cost can be sub-divided into 3 parts:

- Costs incurred on suspension of operations.
- Costs incurred during continued shut down.
- Costs incurred in resuming operation after re-opening.

Question 51 [Shut down/Continue point]: A firm incurs a fixed cost of Rs.1,20,000 at 60% capacity. At 0% capacity, fixed cost is only Rs.40, 000. If its VC Ratio is 80%, find out the Shutdown point.

[Ans.: Rs. 4,00,000/-]

Question 52 [Shut down/Continue point]: A paint manufacturing company manufacture 2,00,000 per annum medium-sized tins of "Spray Lac Paints" when working at normal capacity. It incurs the following costs of manufacturing per unit:

	(Rs.)
Direct Material	7.80
Direct Labour	2.10
Variable overheads	2.50
Fixed overheads	4.00
Product Cost per unit	16.40

The selling price is Rs.21 per and variable selling and administrative expenses is 60 paise per tin.

During the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to Rs.74,000 for the quarter. When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shutdown for the quarter are estimated at Rs.14,000.

- Express your opinion, as to whether the plant should be shut down during the quarter, and
- Calculate the shut down point for the quarter in terms of number of tins.

[Ans.: 14000 tin]

(6 Marks) Nov/08-NC[Adapted]

Question 53 [Shut down/Continue point]: The annual budget of a company at 60% and 80% levels of performance is as under:

Level of Performance	60%	80%
	Rs.('000)	Rs.('000)
Direct Material	360	480
Direct Labour	480	640
Production Overhead	252	276
Administration Overhead	124	132
Selling & Distribution Overhead	136	148
	1352	1676

The company is in great difficulties at the present moment in selling its products and is now operating at 50% level.

The sales revenue for the year is estimated at Rs.9,90,000. The Directors are seriously considering suspending operations till the market picks up.

Market Research undertaken by the Company reveals that there is every indication that in about twelve months' time, the sales will pick up and the company can comfortably operate at 75% level of performance and earn a sales revenue of Rs.18 lakhs in that year.

The Sales personnel of the company do not want to suspend operations for fear of adverse reactions in the market; but the Directors want to decide the issue purely on financial consideration.

If the manufacturing and other operations of the company are suspended for a year, it is estimated that:

- The present fixed costs could be reduced to Rs.2,20,000 per annum.
- The settlement cost of personnel not required would amount to Rs.1,50,000.
- The maintenance of plant has to go on and that would cost Rs.20,000 per annum.
- On resuming operations, the costs connected with opening after a shut-down would amount to Rs.80,000.

Submit a report to the Directors and indicate therein, based on purely financial consideration, whether it would be advisable or not to suspend the company's operation in the current year.

[Ans.: Co. will incur a loss of Rs. 200000 if it continue producing @ 50% & will incur a loss of Rs. 470000 if it shut its operations temporarily]

Question 54: Supreme Ltd, which manufactures the component EXCEL, has achieved a turnover of Rs 600000 for the calendar year 2002. The manager of the company has informed that the company has worked at the profit volume ratio of 25% and the margin of safety of 20%. But he feels due to severe competition, the selling price is to be reduced to maintain the same volume of sales for the year 2003. He does not expect any change in variable costs. He expects that due to cost reduction programme, the profit volume ratio and margin of safety will be 20% and 30% respectively and considerable saving in Fixed cost for 2003.

Even if the company prefers to shut down its operations for 2003, it expects to incur a minimum fixed cost of Rs 60000. You are expected to:

- Present the comparative statement for the year 2002 and 2003 showing under marginal costing.
- What will be minimum sales required, if it decides to shut down its unit in 2003. (11 Marks) Nov./03

[Ans.: (i) Contribution for 2002 Rs. 150000 and 2003 Rs. 112500; (ii) Rs. 93750]

Question 55: TQM Limited makes engines for motor cars for its parent company and for two other motor car manufacturers.

On 31st December, the company has sufficient work order for January and one further order for 21,000 engines. Due to recession in the economy, no further order are expected until May when it is hoped economic prospect for the motor car industry will have improved. Recently factory has been working at only 75% of full capacity and the order for 21000 engines represents about one month production at this level of activity.

The board of directors are currently considering following two options :

- Complete the order in February and close the factory in March and April.

OR

- Operate at 25 per cent of full capacity for each of three months of February, March and April.

The costs per month at different levels of activities are as follows:

	At 75% (Rs.)	At 25% (Rs.)	Idle(Rs.)
Direct material	5,25,000	1,75,000	-
Direct labour	5,23,600	1,73,250	-
Factory overhead:			
Indirect material	8,400	4,900	4,900
Indirect labour	1,01,500	59,500	-
Indirect expenses:			
Repair & maintenance	28,000	28,000	-
Office overhead:			
Staff salaries	1,48,400	98,000	67,550
Other overheads	28,000	19,950	11,200

Other information is as follows:

- Material cost and labour cost will not be incurred where there is no production.
- On the reopening of the factory, one time cost of training and engagement of new personnel would be R. 65,800 and overhauling cost of plant would be Rs. 14,000.
- Parent company can purchase engines from open market at reasonable price.

Required:

To express your opinion, along with calculations, as to whether the plant should be shut down during the month of March and April or operate 25% of full capacity for three months. (11 Marks) June/09-Old Course

[Ans.: TQM Ltd. is recommended to operate at 75% capacity in Feb. and shut down in March & April]

Special Theory Chapters

TOTAL QUALITY MANAGEMENT (TQM)

TQM is composed of three paradigms:

Total = Quality involves everyone and all activities in the company.

Quality = Conformance to Requirements (Meeting Customer Requirements).

Management = Quality can and must be managed.

Definition:

TQM is defined as a set of concepts and tools for getting all employees focused on continuous improvement in the eyes of the customer. Quality is an important aspect of world-class manufacturing. The success of Japanese companies is grass rooted in their long-term commitment to improvement of quality. A world class manufacturing approach demands that the quality must be designed into product and the production process, rather than an attempt to remove poor quality by inspection.

- The TQM approach highlights the need for a customer-oriented approach to management reporting, eliminating some or more of traditional reporting practices.
- TQM seeks to increase customer satisfaction by finding the factors that limit current performance.
- The emphasis of TQM is to design and build quality in the product, rather than allow defectives and then inspect and rectify them. The focus is on the causes rather than the symptoms of poor quality.

Though the goal is zero defects, the methodology is one of continuous improvement.

Three core concepts of TQM:

1. **Quality Control (QC):** It is concerned with the past, and deals with data obtained from previous production, which allow action to be taken to stop the production of defective units.
2. **Quality Assurance (QA):** It deals with the present, and concerns the putting in place of system to prevent defects from occurring.
3. **Quality Management (QM):** It is concerned with the future, and manages people in the process of continuous improvement to the products and services offered by the organization.

Various stages / steps to be taken in the implementation of TQM:

Stage 1: Identification of customers/customer groups: through a team approach (a technique called Multi-voting), the firm should identify major customer groups. This helps to prioritize the list of customers and provides a focus of services.

Stage 2: Identifying customer expectations: Once the major customer groups are identified, their expectations are listed. The question to be answered is – what does the customer expect from the firm?

Stage 3: Identifying customer decision-making requirements and product utilities: Where the focus is on quality improvement, the overriding need is to stay close to the customers and follow their suggestions. In this way, a decision-support system can be developed, incorporating both financial and non-financial information, which seeks to satisfy user requirements. Hence, the firm finds out the answer to – what are customer's decision – making requirements and product utilities? The answer is sought by listing out managerial perceptions and not by actual interaction with the customers.

Stage 4: Identifying perceived problems in decision-making process and product utilities: Using participative processes such as brainstorming and multi-voting, the firm seeks to list out its perception of problem areas and shortcomings in meeting customer requirements.

This will list out areas of weakness where the greatest impact could be achieved through the implementation of improvements. The firm identifies the answer to the question – what problem areas do we perceive in the decision-making process?

Stage 5: Comparison with other organizations and bench marking: Detailed and systematic internal deliberations allow the firm to develop a clear idea of their own strengths and weaknesses and of the areas of most significant deficiency. The benchmarking exercise allows the firm to see how other companies are coping with similar problems and opportunities.

Stage 6: Customer feedback: Stages 1 to 5 provide information base, developed without reference to the customer. This is rectified at stage 6 with a survey of representative customers, which embraces their views on perceived problem areas. Interaction with the customers and obtaining their views, helps the firm in correcting its own perceptions and refining its processes.

Stage 7 & 8: The identification of improvement opportunities and Quality Improvement Process: The outcomes of the customer survey, benchmarking and internal analysis provides the inputs for stages 7 and 8, i.e. the identification of improvement opportunities and the implementation of a formal improvement process. This is done through a six-step process called PRAISE, for short.

“PRAISE Analysis”

The identification of improvement opportunities and implementation of quality improvement process (Stages 7 and 8) of the TQM Process is through a six-step activity sequence, identified by the acronym ‘PRAISE’.

Step	Activity	Elements
1	Problem Identification	- Areas of Customer Dissatisfaction - Absence of Competitive Disadvantage - Complacency Regarding Present Arrangements
2	Ranking	Priorities problems and Opportunities by - Perceived Importance, and - Ease of Measurement and solution
3	Analysis	- Ask “why?” to identify possible causes. Keep asking “why?” to move beyond the symptoms and to avoid jumping to premature calculations. - Ask “what?” to consider potential considerations. - Ask “how much?” to quantify cause and effect.
4	Innovation	- Use Creative thinking to generate potential solution. - Operationalise these solutions by identifying Barriers to implementation, Available enablers, and People whose co-operation must be sought
5	Solution	- Implement the preferred solution - Take appropriate action to bring about the required changes - Reinforce with training and documentation back-up
6	Evaluation	- Monitor the effectiveness of actions - Establish and interpret performance indicators to track progress towards objectives - Identify the potential for further improvements and return to step 1

Difficulties experienced at each step in the PRAISE process:

Step	Activity	Difficulties	Remedies
1	Problem Identification	- Effects of a problem are apparent but problem themselves are difficult to identify. - Problem may be identifiable, but it is difficult to identify a measurable improvement opportunity	- Participative approaches like brainstorming, multi-voting, panel discussion - Quantification and precise definition of problem
2	Ranking	- Difference in perception of individuals in ranking. - Difference in preferences based on functions e.g. production, finance, marketing etc. - Lack of consensus between individuals	- Participative approach - Subordination of individual to group interest
3	Analysis	Adoption of adhoc approaches and quick-fix solutions	Lateral Thinking Brainstorming
4	Innovation	- Lack of creativity or expertise - Inability to operationalise ideas, i.e. convert thoughts into action points	Systematic evaluation of all aspects of each strategy

5	Solution	Resistance from middle managers	• Effective internal communication • Training of personnel and managers • Participative approach
6	Evaluation	• Problems in implementation • Lack of measurable data for comparison of expectations with actual	Effective control system to track actuals Feedback system

Central to the PRAISE system are (a) quality control – the search for continuous improvements in quality – and (b) total employee involvement – the co-operation and commitment of employees. This dual approach provides a single focus – the customer – whose increased satisfaction remains the primary goal of the procedure.

Fundamental principles associated with four P's of quality improvement

The problems listed for the PRAISE process, may lead to P of TQM process. It is possible that the organization is led to Total Quality Paralysis instead of improvement. To avoid such disruption and paralysis the following principles (called the four P's) of TQM should be followed:

1. **People:** Some individuals are not ideally suited to the participatory process of TQM. This will be inferred from lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a "Mute Spectator" at TQM meetings etc. To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges.
2. **Process:** It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
3. **Problem:** Problems need to be approached in a bite-sized chunks, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with recognition of contribution made by individual participants.
4. **Preparation:** Additional courses on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process.

This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and also who are involved at the data input stage.

A three-point action plan for implementation of the process is:

1. **Bite-sized chunks:** Big improvement opportunities are generally complex and require extensive inter departmental co-operation. The choice of a relatively small problem in the first instance provides a greater chance of success. Therefore, the TQM team has to proceed from small to big issues gradually.
2. **Solvable problem:** The problem selected should not be trivial, but it should be one with a potential impact and a clear improvement opportunity. Measurable progress towards implementation should be accomplished within a reasonable time in order to maintain the motivations of participants and advertise the success of the improvement itself.
3. **Recognition of participants:** The successful projects and team members should receive appropriate recognition throughout the enterprise. Prominent individuals should be rewarded for their efforts as a measure of personal recognition and as encouragement to others. The reward may be recognition itself, and sometimes monetary/non-monetary prizes may also be given.

Six Cs of TQM

1. **Commitment** - If a TQM culture is to be developed, so that quality improvement becomes normal part of everyone's job, a clear commitment, from the top must be provided. Without this all else fails.
2. **Culture** - Training lies at the centre of effecting a change -in culture and attitudes. Negative perceptions must be changed to encourage individual contributions.
3. **Continuous improvement** - TQM is a process, not a program, necessitating that we are committed in the long term to the never ending search for ways to do the job better.

4. **Co-operation:** The on-the-job experience of all employees must be fully utilized and their involvement and co-operation sought in the development of improvement strategies and associated performance measures.
5. **Customer focus:** Perfect service with zero defects in all that is acceptable at either internal or external levels.
6. **Control:** Documentation, procedures and awareness of current best practice are essential if TQM implementations are to function appropriately the need for control mechanisms is frequently overlooked, in practice.

Control in the TQM

The fundamental principles of TQM focus on continuous improvement, which enhance the satisfaction of customer requirements. A properly defined control function is essential for achievement of TQM objectives.

This control is prevalent in the TQM process in the following areas:

1. **Process definition:** The definition of the process, inputs and outputs gives a framework for the writing of procedures and standard methods and also provides a focus for improvement opportunities. The clear definition and documentation of procedures facilitates job flexibility, makes control easier and increases the level of productivity.
2. **Database:** Documentation of key data on processes is an important step in TQM. By charting processes for each activity, establishing time barriers, constraints, priorities degrees of difficulty and expected improvement times, a critical database is established.
3. **Quality Manual:** It defines the basic philosophy of the organization, the structure and responsibilities of managers and departments and the relationship between them. It also contains the methods to be used to ensure quality, including the composition of teams and the audit procedure to be adopted.
4. **Improved decision-making:** By providing a sound control environment, which supports business decisions with appropriate measurement and analysis, the controllership function pursues complete customer satisfaction. The aim is to achieve acknowledged industry leadership for excellence of process, personnel and service.
5. **Control and continuous improvement:** TQM facilitates not only control, but also continuous improvement. The monitoring of the data around a process will allow modifications which makes it in-control and capable. As changes or improvements are made they are documented and the system updated so that everyone uses the current best method.
6. **Use of Control reports:** Diagrams, Statistical quality control charts and cost of quality reports are prepared for periodic review of the TQM system in operation. The deviation from expected costs are analyzed for suitable corrective action. The various types of costs to be reported are (i) Prevention Costs; (ii) Appraisal Costs; (iii) Internal failure costs; and (iv) External Failure Costs.

Components of cost to be reported in a Cost of Quality Report

1. **Prevention Costs:** These are incurred in preventing the production of products that do not conform to specification. They include the costs of preventive maintenance, quality planning and training and the extra costs of acquiring higher quality.
2. **Appraisal Costs:** These are incurred to ensure that materials and product meet quality performance standards. They include the costs of inspecting purchased parts, work in process and finished goods, quality audits and field test.
3. **Internal Failure Costs:** These are associated materials and products that fail to meet quality standards. They include costs incurred before the product is dispatched to the customer, such as the costs of scrap, repair, downtime and work stoppages caused by defects.
4. **External failure Costs:** These are incurred when inferior products are delivered to customers. They include the cost of handling customer complaints, warranty replacement, repairs of returned products and the costs arising from a damaged company reputation.

Note: Prevention and appraisal cost are called Costs of Quality Compliance while Internal and costs are called Costs of Non-compliance.

Remedies to correct misdirection in TQM

TQM may become misdirected on the following grounds:

1. Focus on documentation process and ill-measurable outcomes
2. Emphasis on quality assurance rather than improvement; and

3. Internal-focus, which is at odds with the alleged customer orientation.

This can be correction by reviving the customer focus with total employee involvement (TEI), oriented towards organizational goals. This will involve the following areas of thrust:

1. Loyalty to the vision of the company through the pursuit of tough, visible goals.
2. Recognition of satisfied customers and motivated employees as the true assets of a company.
3. Delegation of decision-making to the point of responsibility by eliminating hierarchical ties of authority to allow direct and speedy response to customer needs.
4. Decentralization of management to make best use of the creative energy of the workforce.

Question 1: Define Total Quality Management? What are the six Cs for successful implementation of TQM? (4 Marks) May/04, (4 Marks) May/05 & (6 marks) May/07

Question 2: Discuss the benefits accruing from the implementation of a Total Quality Management programme in an organization. (4 Marks) Nov./08

Answer: The benefits accruing from the implementation of a Total Quality Management programme in an organisation are:

1. There will be increased awareness of quality culture in the organization.
2. It will lead to commitment to continuous improvement.
3. It will focus on customer satisfaction.
4. A greater emphasis on team work will be achieved

Question 3: How does Total Quality Management (TQM) facilitates value addition in an organization? (4 Marks) Nov./02

Question 4: Eastern Switching Co. (ESC) produces telecommunications equipment Charles, ESC's president, believes that product quality is the key to gaining competitive advantage. Laurent implemented a total quality management (TQM) program with an emphasis on customer satisfaction. The following information is available for the first Year (2004) of the TQM program compared with the previous year.

	2003	2004
Total number of units produced and sold	10,000	11,000
Units delivered before scheduled delivery data	8,500	9,900
Number of defective units shipped	400	330
Number of customer complaints other than for defective units	500	517
Average time form when customer places for defective unit to		
When unit is delivered to the customer	30 days	25 days
Number of units reworked during production	600	627
Manufacturing lead time	20 days	16 days
Direct and indirect manufacturing labor - hours	90,000	1,10,000

Required:

1. For each of the years 2003 and 2004, calculate
 - a. Percentage of defective units shipped.
 - b. On-time delivery rate
 - c. Customer complaints as a percentage of units shipped
 - d. Percentage of units reworked during production
2. On the basis of your calculations in requirement I, has ESC's performance on quality and timeliness improved?
3. Philip Larkin, a member of ESC's board of directors, comments that regardless of the effect That the program has had on quality, the output per labor-hour has declined between 2003 and 2004. Larkin believes that lower output per labor-hour will lead to an increase in cost and lower operating income.
 - a. How did Larkin conclude that output per labor-hour declined in 2004 relative to 2003?
 - b. Why might output labor-hour decline in 2004?
 - c. Do you think that a lower output per labor-hour will decrease operating income in 2004? Explain briefly.

[Ans.:

	2003		2004	
a. Percentage of defective units shipped	$\frac{400}{10,000} = 4\%$		$\frac{330}{11000} = 3\%$	
b. Customer complaints as a percentage of units shipped	$\frac{500}{10000} = 5\%$		$\frac{517}{11000} = 4.7\%$	

c. On-time delivery	$\frac{8500}{10000} = 85\%$	$\frac{9900}{11000} = 90\%$
d. Percentage of units reworked during production	$\frac{600}{10000} = 6\%$	$\frac{627}{11000} = 5.7\%$

Question 5: TQ Ltd. implemented a quality improvement programme and had the following results:

	2007	2008
	(Figures in Rs. '000)	
Sales	6,000	6,000
Scrap	600	300
Rework	500	400
Production inspection	200	240
Product warranty	300	150
Quality training	75	150
Materials inspection	80	60

You are required to:

- Classify the quality costs as prevention, appraisal, internal failure and external failure and express each class as a percentage of sales.
- Compute the amount of increase in profits due to quality improvement.

[Ans.: (i) Classification of Quality Costs

	2007	% of sales	2008	% of sales
Sales	6,000		6,000	
Prevention				
Quality training	75	1.25	150	2.5
Appraisal				
Product Inspection	200		240	
Materials Inspection	80		60	
	280	4.67	300	5
Internal Failure				
Scrap	600		300	
Rework	500		400	
	1100	18.33	700	11.67
External Failure				
Product warranty	300	5	150	2.5
	1755	29.25	1300	21.67

(ii) Cost reduction was effected by 7.58% (29.25 – 21.67) of sales, which is an increase in profit by Rs.4,55,000. (6 Marks) Nov/08-NC& ICWA-June/03 [Adapted]

Question 6: Your company plans to operate department d at normal capacity next year producing one lakh units of product P. Assuming no defective works, these units can be manufactured in 2.5 lakhs labour hours at a cost of Re.0.50 per hour, factory overhead would amount to Rs.1,50,000 of which Rs.50,000 would be fixed five units of materials can be purchased in two qualities; a high quality at Rs.1.05 per unit or a lower quality at Re.0.80 per unit.

Under expected conditions, using high quality materials 10% of the work will be defective requiring complete replacement of the material, additional labour costs and variable overhead, scrap materials recovered from defectives production could be sold at Re.0.30 per unit of high quality material used.

As an alternative to this arrangement, the use of the lower quality material is being considered by this would require an extra operation to be performed on it. An additional machine and tooling would be needed at a cost of Rs.3, 000 per annum. The additional operation would take half an hour for each unit of product P produced, not talking defective work into a account.

It is estimated that 20% of the work would be defective all of which would require complete replacement. Scrap material from the lower quality material could be sold for Rs.5, 000.

Present information to management indicating the more profitable course of action.

[Ans.: Had there been no defectives for production of 1,00,000 pieces of P 1,00,000X5=5,00,000 units of raw material would be required. In case of high quality material, defective being 10% total raw material required is 5,00,000 units/0.90 =5,55,556 units. In case of lower quality material, defective being 20%, total raw material requirement is 5,00,000 units/0.80 =6,25,000 units. Similarly labour and variable overhead requirement are to be adjusted accordingly.

I. Using high quality materials	(scrap 10%)	(Rs)
Cost of 1,00,000 pieces of P		8,66,666
II. Using lower quality materials	(scrap 10%)	(Rs)
Cost of 1,00,000 pieces of P		8,74,250

Analysis: Hence the high quality material should be used.

Question 7: A company manufactures a component on batches of 2000 each. Each component is tested before being sent to the agents for sales. Each components can be tested at the factory at a cost of Rs.25. If any component is found to be defective, it can be rectified by spending Rs.200. In view of the large demand for the components and the sophisticated system of manufactures, a proposal came up that the practice of pre –testing of the components be dispensed with to save costs. In that event, any defective component is received back from the customer under warranty, the cost of rectification and redespach will be Rs.400 per component. State at what percentage of manufacture of components will the company find it cheaper to pre-test each component. (ICWA-Dec/00)

[Ans.:-Let the defectives be'd'

(I) Total Cost	Rs.(2000x25)+200d
(II) Percentage of defectives to total components	$250/2000 \times 100 = 12.5\%$

Analysis: If defectives exceed 12.5% of the total number of components per-testing is recommended.

Question 8: A company manufactures a single product, the estimated costs of which are as follow:

Direct Materials Rs.10 each, Direct wages 8 hours at Re.0.50 per hour
Overhead absorption rate Rs. 1.75 per hour.(50% fixed overhead include)

During this period 1,000 units will be produced and sold as follow:-

900 units of first at	Rs.30 each
50 units of second at	Rs.20 each
50 units of third at	Rs.10 each

Present information to management showing the loss due to the production of inferior units.

By reprocessing the inferior units taking the full reprocessing time of a further 8 hours and adding further material Costing Rs.4 per unit these," seconds" and "thirds" can be converted into firsts. Present information to the management.

[Ans.: Note: No change in the profit position hence this need not be considered.]

Question 9: Carlon Ltd. makes and sells a single product; the unit specifications are as follows:

Direct Materials X	: 8 sq. metre at Rs 40 per square metre
Machine Time	: 0.6 Running hours
Machine cost per gross hour	: Rs. 400
Selling price	: Rs. 1,000

Carlon Ltd. requires to fulfil orders for 5,000 product units per period. There are no stock of product units at the beginning or end of the period under review. The stock level of material X remains unchanged throughout the period.

Carlon Ltd. is planning to implement a Quality Management Programme (QPM). The following additional information regarding costs and revenues are given as of now and after implementation of Quality Management Programme.

Before the implementation of QMP	After the implementation
1. 5% of incoming material from suppliers scrapped due to poor receipt and storage organisation.	1. Reduced to 3%.
2. 4% of material X input to the machine process is wasted due to processing problems.	2. Reduced to 2.5%
3. Inspection and storage of Material X costs Re. 1 per square metre purchased.	3. No change in the unit rate

- | | |
|--|---|
| 4. Inspection during the production cycle, calibration checks on inspection equipment vendor rating and other checks cost Rs. 2,50,000 per period | 4. Reduction of 40% of the existing cost. |
| 5. Production Qty. is increased to allow for the downgrading of 12.5% of the production units at the final inspection stage. Down graded units are sold as seconds at a discount of 30% of the standard selling price. | 5. Reduction to 7.5% |
| 6. Production Quantity is increased to allow for return from customers (these are replaced free of charge) due to specification failure and account for 5% of units actually delivered to customer. | 6. Reduction to 2.5% |
| 7. Product liability and other claims by customers is estimated at 3% of sales revenue from standard product sale. | 7. Reduction to 1%. |
| 8. Machine idle time is 20% of Gross machine hrs used (i.e. running hour = 80% of gross/hrs.). | 8. Reduction to 12.5%. |
| 9. Sundry costs of Administration, Selling and Distribution total – Rs. 6,00,000 per period. | 9. Reduction by 10% of the existing. |
| 10. Prevention programme costs Rs. 2,00,000 | 10. Increase to Rs. 6,00,000. |

The Total Quality Management Programme will have a reduction in Machine Run Time required per product unit to 0.5 hr.

Required:

- (a) Prepare summaries showing the calculation of (i) Total production units (pre inspection), (ii) Purchase of Materials X (square metres), (iii) Gross Machine Hours.
In each case, the figures are required for the situation both before and after the implementation of the Quality Management Programme so that orders for 5,000 product units can be fulfilled.
- (b) Prepare Profit and Loss Account for Carlon Ltd. for the period showing the profit earned both before and after the implementation of the Total Quality Programme. (16 Marks) May/05

[Ans.: (a)

	Existing	After TQM Programme
Total units before inspection	6,000	5,541
Total purchases	52,632	46,871
Gross time	4,500	3,167
(b) Net profit	3,67,088	

Question 10: Burdoy Plc has a dedicated set of production facilities for component X. A just in time system is in place such that no stock of materials: work-in-progress or finished goods are held.
At the beginning of the period 1, the planned information relating to the production of component X through the dedicated facilities as follows:

- Each unit of component X has input materials: 3 units of material A at Rs.18 per unit and 2 units of material B at Rs.9 per unit.
- Variable cost per unit of component X (excluding materials) is Rs.15 per unit worked on.
- Fixed cost of the dedicated facilities for the period Rs.162,000.
- It is anticipated that 10% of the units of X worked on in the process will be defective and will be scrapped.

It is estimated that customer will require replacement (free of charge) of faulty units of components X at the rate of 2% of the quantity invoiced to them in fulfillment of orders.

Burdoy Plc is pursuing a total quality management philosophy. Consequently all losses will be treated as abnormal in recognition of a zero defect policy and will be valued at variable cost of production. Actual statistics for each period 1 to 3 for component X are shown in appendix 3.1. No change have occurred from the planned price level for materials, variable overhead or fixed overhead costs.

Required:-

- Prepare an analysis of the relevant figure provided in appendix 3.1 to show that the period 1 actual results were achieved at the planned level in respect of (i) Quantities and losses and (ii) Unit cost levels for materials and variable costs.
- Use your analysis from (a) in order to calculate the value of the planned level of each of internal and external failure cost for period 1.
- Actual free replacements of component X to customers were 170 units and 40 units in period 2 and 3 respectively. Other data relating to period 2 and 3 is shown in appendix 3.1.

Burdoy Plc authorized additional expenditure during period 2 and 3 as follows:

Period 2: Equipment accuracy checks of Rs.10,000 and staff training of Rs.5,000

Period 3: Equipment accuracy checks of Rs.10,000 plus &5,000 of inspection costs; also staff training cost of Rs.5,000 plus Rs.3,000 on extra planned maintenance of equipment.

Required:-

- Prepare an analysis for each of period 2 and 3 which reconciles the number of components invoiced to customer with those worked on in the production process. The analysis should show the changes from the planned quantity of process losses and change from the planned quantity of replacement of faulty components in customer hands.
- Prepare a cost analysis for each of period 2 and 3 which shows actual internal failure costs, external failure costs, appraisal costs and prevention costs.
- Prepare a report which explains the meaning and internal relationship of the figure in Appendix 3.1 and the analysis in (a), (b), and (c) (i) (ii). The report should also give examples of each cost type and components on their use in the monitoring and progressing of the TQM policy being pursued by Burdoy Plc.

Appendix 3.1 Actual Statistics for component X

	Period 1	Period 2	Period 3
Invoices to customers (units)	5,400	5,500	5,450
Worked on in the process	6,120	6,200	5,780
Total Costs:			
Material A and B (Rs.)	440,640	446,400	416,160
Variable cost of production (Rs.) (excluding material cost)	91,800	93,000	86,700
Fixed cost	162,000	177,000	185,000

[Ans:

(a) (i)	Units
Components worked on in the process	6120
Less: planned defective units	612
replacements to customer (2% X 5400)	108
Components invoiced to customers	5400

Therefore actual result agree with planned results

(ii) Planned components cost = (3 X Rs.18 for material A) + (2 X Rs.9 for material B) + Rs.15 variable cost =Rs.87

Comparing with the data in appendix:

Materials = Rs.440 640/6120 =Rs.72

Variable overhead = Rs.91 800/6120 = Rs.15

This indicates that prices were at the planned levels.

(b) Internal failure costs = Rs.53 244(612 units X Rs.87)

External failure costs = Rs.9396 (108 units X Rs.87)

	Period 2 (units)	Period 3 (units)
(c) (i)		
Components invoiced to customers	5500	5450
Planned replacement (2%)	110	109
Unplanned replacement	60 (170-110)	-69 (40-109)
Components delivered to customers	5670	5490
Planned process defects (10% of worked on in the process)	620	578
Unplanned defects (difference to agree with with final row)	-90	-288
Components worked on in the process	6200	5780

(ii)	Period 2(Rs.)	Period 3(Rs.)
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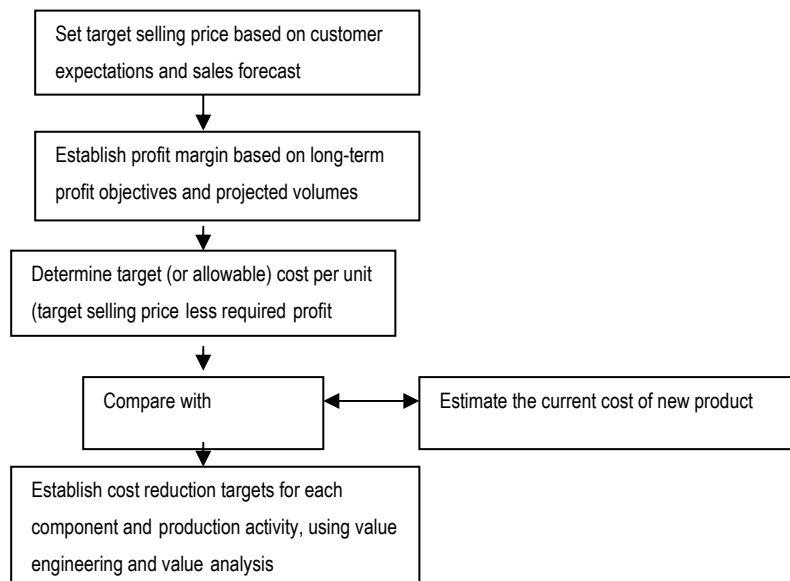
Internal failure costs	46,110 (620-90) X Rs. 87	25,230 (578-288) X Rs.87
External failure costs	14,790 (110+60) X Rs.87	3,480 (109-69) X Rs.87
Appraisal costs	10,000	15,000
Prevention costs	5,000	8,000]

TARGET COSTING & LIFE CYCLE COSTING

Meaning

Target Costing is defined as “a structured approach to determine the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated-selling-price”

Steps in Target Costing approach to pricing:



1. **Setting of target selling price:** The setting of target selling price of a product which customers are prepared to pay, depend on many factors like design specifications of the product, competitive conditions, customer's demand for increased functionality and higher quality projected production volume, sales forecasts etc. A concern can set its target selling price after taking into account all of the aforesaid factors.
2. **Determination of target costs:** Target profit margin may be established after taking into account long-term profit objectives and projected volume of sales. On deducing target profit margin from target selling price, target cost is determined.
3. **Estimate the actual cost of the product:** Actual cost of the product may be determined after taking into account the design specifications, material cost and other costs required to produce the product.
4. **Comparison of estimated cost with actual cost:** In case the estimated cost of the product is higher than that of the target cost of the product then the concern should resort to cost reduction methods involving the use of Value Engineering / Value Analysis tools.

VALUE ENGINEERING (VE)

Value Engineering involves searching for opportunities to modify the design of each component or part of a product to reduce cost, but without reducing the functionality or quality of the product. **Value Analysis** entails studying the activities that are involved in producing the product to detect non-value adding activities that may be eliminated or minimized to save costs, but without reducing the functionality or quality of the product.

Scope

Value Engineering and Value Analysis help identify costs into

- a) Value-Added Cost and
- b) Non Value-Added Cost. The objective is to retain (if possible, reduce) value-added cost, while totally avoiding or eliminating non-value added costs.

Value-added cost: A value-added cost is a cost that, if eliminated, would reduce the value or utility (usefulness) customers obtain from using the product or service.

Non value-added cost: A non value-added cost is a cost that, if eliminated would not reduce the value or utility customers obtain from using the product or service. It is a cost that the customer is unwilling to pay to the company.

Some issues analyzed during VE review are:

1. Elimination of unnecessary functions from the production process:

- This involves a detailed review of the entire manufacturing process to see if there are any steps that add no value to the product, e.g. interim quality review before further processing and final quality check.
- By eliminating unnecessary or duplicate functions, the firm can reduce their associated direct or overhead costs from the total product cost.
- The possible repercussions of elimination of any intermediate production function should be carefully analyzed. The engineering team must be careful to develop work-around steps that eliminate the need for the original functions.

2. Elimination of unnecessary product qualities:

- The product quality should be studied with reference to the nature of its use, longevity of product's useful life.
- If some unnecessary quality e.g. excessive degree of sturdiness in consumable item (as opposed to a durable item) can be eliminated, it should be done in order to save significant material and other product costs.
- However, visible reduction in durability or reliability cannot be stretched too far. Hence any designs that have had their structural integrity reduced must be thoroughly tested to ensure that they meet all design standards.

3. Design Minimization:

- This involves the creation of a design that uses fewer parts or has fewer features.
- This approach is based on the assumption that a minimal design is easier to manufacture and assemble. Also, with fewer parts to purchase, less procurement expenses is associated with the product.
- However, sometimes it would be less expensive to settle for a few extra standard parts that are more easily and cheaply obtained, rather than customized pre-fabricated parts, which complicate the assembly process.

4. Better product Design to suit manufacturing process:

- This is also known as **Design For Manufacture and Assembly (DFMA)** and involves the creation of a product design that can be created in only a specific manner. For example, a toner cartridge for a laser printer is designed so that it can be successfully inserted into the printer only when the sides of the cartridge are correctly aligned with the printer opening; all other attempts to insert the cartridge will fail.
- When used for the assembly of an entire product, this approach ensures that a product is not incorrectly manufactured or assembled, which would call for a costly disassembly or product recalls from customers who have received defective goods.

5. Substitution of Parts:

- This is also called as Component Parts Analysis. This approach encourages the search for less expensive components or materials that can replace more expensive parts currently used in a product design.
- Substitution of new parts is encouraged since new materials are being developed every year.
- However parts substitution must be accompanied by a review of related changes elsewhere in the design and the consequent impact on total costs.
- This also involves allied analysis on tracking the intentions of suppliers to continue production of parts in the future. If parts are not available, they must be eliminated from the product design.

6. Combination of Steps:

- Sometimes, a careful review of all processes associated with a product reveals that some steps can be eliminated, other steps can be consolidated, or that several can be accomplished by one person, rather than having people in widely disparate parts of the production process to perform them. This is also known as Process Centering.
- By combining steps, transfer and queue time can be eliminated from the production process, which in turn reduces the chances of damage during transfers.

7. Search for better way of doing things:

- This seeks to answer a basic question – is there a better way?
- It strikes at the core of the cost reduction issue. It is a more general attempt to start from scratch and build a new product or process that is not based in any way on pre-existing ideas.
- Improvements resulting from this technique tend to have the largest favorable impact on cost reductions but can also be the most difficult for the organization to adopt, especially if it has used other designs or systems for production.

Role of a firm's Suppliers in its Value Engineering or Cost Reduction drive

Value Engineering also involves calling on the services of a company's suppliers to assist in the cost reduction effort. Suppliers of materials can have significant role in value engineering due to the following reason:

1. Suppliers can contribute information on enhanced types of technology of materials.
2. Suppliers specialize in areas that a company has no information about and can share product expertise.
 - They may have also conducted extensive value engineering for the components they manufacture, resulting in advanced designs that a Company may be able to incorporate into its new products.
 - Suppliers may have also redesigned their production processes, or can be assisted by a company's engineers in doing so, producing cost reductions or decreased production waste that can be translated into lower components costs for the company.

KAIZEN COSTING

Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

The initial VE review may not be complete and perfect in all costs aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is call as kaizen costing.

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. On the contrary, there are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase.

Kaizen Costing Process: Activities in kaizen costing include elimination of waste in production, assembly and distribution processes, as well as the elimination of work steps in any of these areas. Thus kaizen costing is really designed to repeat many of the value engineering steps for as long as a product is produced, constantly refining the process and thereby stripping out extra costs at each stage.

Savings from Kaizen Costing: The cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering. But these are still significant since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a company to still attain its targeted profit margins Mille continuing to reduce cost.

Multiple Versions of Products - Continuous Kaizen Costing: Multiple improved versions of products can be introduced to meet the challenge of gradually reducing costs and prices. The market price of products continues to drop over time, which forces a company to use both target and kaizen costing to reduce costs and retain its profit margin.

However, prices eventually drop to the point where margins are reduced, which forces the company to develop a new product with lower initial cost and for which kaizen costing can again be used to further reduce costs. This pattern may be repeated many times as a company forces its costs down through successive generations of products.

The exact timing to switch to a new product is easy to determine well in advance since the returns from kaizen costing follow a trend line of gradually shrinking savings. Since prices also follow a predictable downward track, plotting these two trend lines into the future reveals when a new product version must be ready for production.

Advantages of Target Costing:

1. **Innovation:** It reinforces top-to-bottom commitment to process and product innovation and is aimed at identifying issues to be resolved.
2. **Competitive Advantage:** It enables a firm to achieve competitive advantage over other firms in the industry. The firm, which achieves cost reduction targets realistically, stands to gain in the long run.
3. **Market Driven Management:** It helps to create a company's competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
4. **Real Cost Reduction:** It uses management control systems to support and reinforce manufacturing strategies and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lowest cost.

Limitations of Target Costing:

1. **Time Factor:** The development process can be lengthened to a considerable extent since the design team may require a number of design iterations before it can devise a sufficiently low-cost product that meets the target cost and margin criteria.
2. **Responsibility for Cost Reduction:** A large amount of mandatory cost cutting can result in finger-pointing in various parts of the company, especially if the cost reduction targets are not equitably shared. For example the industrial engineering staff will not be happy it is required to completely alter the production layout in order to generate cost savings, while the purchase staff is not required to make any cost reductions through supplier negotiations. Strong inter-personal and negotiation skills are required on the part of the project manager, to avoid this problem.
3. **Co-ordination:** Having representatives from a number of departments on the design team can sometimes make decision-making difficult, as there are too many opinions regarding design issues. Resolving this difficulty requires a strong team manager, as well as a long-term commitment on the part of a company to weed out those who are not willing to act in the best interests of the team.

Cost Accountant's role in a Target Costing Environment:

1. **Cost Estimation:** To provide other members of the design team a running series of cost estimates based on initial design sketch, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes.
2. **Permissible Cost Ranges:** To provide estimates within a high-low range costs, since preliminary data will necessarily be vague. However, this estimated cost range should be tightened as more information becomes available.
3. **Capital Budgeting Analysis:** To cater to capital budgeting requests generated by the design team based on types of equipment needed for the anticipated product design, product revenues and costs, rates of return etc. The Cost Accountant should also be able to answer questions regarding uncertainties and risk analysis.
4. **Cost Principles Explanation:** To work with the design team to help it understand the nature of various costs (such as cost allocations based on an activity-based costing system), as well as the cost-benefit trade-offs of using different design or cost operations in the new product.
5. **Review of Cost Reduction Targets:** To track the gap between the current cost and the target cost that is the design team's goal providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.
6. **Final Review and Feedback:** To compare a product's actual cost to the target cost after the design is completed, and for as long as the company sells the products is a necessary step because management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

Impact of target costing on profitability

Assured Profit by constant review: Target Costing places detailed continuing emphasis on product costs throughout the life cycle of every product that it is unlikely that a company will experience runaway costs. Also the management is completely aware of costing issues since it receives regular reports from the cost accounting members of all design teams.

Price Determination and Consequent Cost Control: Target Costing improves profitability through precise targeting of the correct prices at which the company feels it can field a profitable product in the marketplace that will sell in a robust manner. The traditional cost-plus approach revolves around designing a product, determining its cost, adding a profit margin and failing to understand why its resoundingly high price does not attract buyers. Thus, target costing results not only in better cost control but also in better price control.

Target costing can have positive impact on profitability, depending on the commitment of management to its use, the constant involvement of cost accountants in all phases of a product's life cycle, and the type of strategy a company follows. Target costing is really part of a larger concept called concurrent engineering, which requires participants from many departments to work together on project teams. It is indeed one of the most proactive systems found in the entire range of accounting knowledge.

Features of Target Costing Data:

1. **Non-Traditional:** The traditional sources of cost data is a central accounting data base consisting of accounts payable, billings, bills of material, and inventory records. These do not provide information required for Target Costing.
2. **Futuristic:** Target Costing Data is essentially futuristic, as it is associated with new and improved products, new designs and manufacturing processes.
3. **Poorly defined:** The data for Target Costing project is more poorly defined information. The Cost Accountant has to start from scratch in order to estimate costs. In earlier stages of product designs, "best possible guesses" may have to be used.

Steps involved in implementing a Target Costing System:

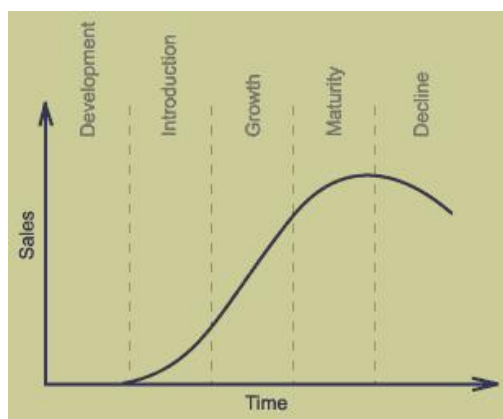
1. **Create a Project Charter:** Project Charter is a document, approved by top management that describes its goals and what it is authorized to do. This Charter is based on the corporate mission statement and related goals. Written approval of Project Charter by the top management provides the target costing effort with a strong basis of support and direction in all subsequent efforts.
2. **Obtain a Management Sponsor:** Management Sponsor is an individual belonging to top management. His role will be to support the initiative in all respects, to obtain funding, to co-ordinate with other members of top management, to eliminate problems in a timely manner.
3. **Obtain a Budget:** The funding should be based on a formal allocation of money through the corporate budget. The fund should be given unreservedly to the target costing effort.
4. **Assign a Strong Team Manager:** The Target Costing Team involves the active participation of many members with diverse backgrounds. A strong Team Manager is required to bring the group together as a smooth functioning team focused on key objectives. He should be skilled in dealing with management, the use of project tools and working with a diverse group of people. This manager should be a full-time employee, so that his or her complete attention can be directed towards the welfare of the project.
5. **Enroll Full-time Participants:** It is essential that the members of the team be devoted to it full-time rather than trying to fulfill other commitment elsewhere in the company at the same time. They should have a single focus on ensuring the success of the target- costing program.
6. **Use Project Management Tools:** Target costing can be a highly complex effort especially for high-cost products with many features and components. The team should use all available project management tools, such as Microsoft Project (for tracking the completion of specific tasks), a company database containing various types of costing information and a variety of product design tools.

PRODUCT LIFE CYCLE

Product life cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range.

Product life cycle spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. For products like motor vehicles this time span may range from 5 to 7 years. For some basic pharmaceuticals, the time span may be 7 to 10 years. In case of cameras, photocopying machines etc. the life is more than 100 years.

Phases in product life cycle



The four identifiable phases in the Product Life Cycle are (a) introduction (b) Growth (c) Maturity and (d) Decline. A comparative analysis of these phases is given below:

Particulars	Introduction	Growth	Maturity	Decline
Phase	I	II	III	IV
Sales Volume	Initial stages, hence low	Rise in sales levels at increasing rates.	Rise in sales levels at decreasing rates.	Sales level off and then start decreasing.
Prices of Products	High levels to cover initial costs and promotional expenses.	Retention of high level prices except in certain cases*	Prices fall closer to cost, due to effect of competition	Gap between price and cost is further reduced.
Ratio of promotion expenses to Sales	Highest, due to effort needed to inform potential customers, launch products, distribute to customers etc.	Total expenses remain the same, while ratio is reduced due to increase in sales.	Ratio reaches a normal % of sales. Such normal % becomes the industry standard.	Reduced sales promotional efforts as the product is no longer in demand.
Completion	Negligible and insignificant	Entry of a large number of competitors	Fierce Competition	Starts disappearing due to withdrawal of products
Profits	NIL due to heavy initial costs.	Increase at a rapid pace.	Normal rate of profits since costs and prices are normalized.	Declining profits due to price competition, entry of new products etc.
Costs	R & D cost/Design cost.	Promotional cost/ Capacity costs	Manufacturing cost/ Distribution costs/ Product support cost.	Plants reused/ sold/scrapped /related costs.

* In the growth stage, the firm will maintain the prices at the high levels, in order to realize maximum profits. Price reduction will not be undertaken unless (a) the low prices will lead

The major characteristics of product life-cycle concept are as follows:

1. The products have finite live and pass through the cycle of development, introduction, growth, maturity decline and deletion at varying speeds.
2. Product cost, revenue and profit patterns tend to follow predictable courses through the product life cycle, Profits first appear during the growth phase and after stabilizing during the maturity phase declines at the point of deletion.
3. Profit per unit varies as products move through their life cycles.

4. Each phase of the product life cycle poses different threats and opportunities that give rise to different strategic actions.
5. Products require different functional emphasis in each phase-such as all R&D emphasis in the development phase and a cost control emphasis in the decline phase.
6. Finding new uses or getting the present users to increase their consumption, may extend the life of the product.

Stages in products life cycle

The life cycle of manufactured product will consist of the following stages:

1. Market Research – what customer wants, how much he is prepared to pay for it & how many he will buy.
2. Specification – Conversion of market research into a detailed specification. Max. Permissible manufacturing cost, functionalities, no. required & delivery date is provided to engineering department.
3. Design – Design engineers produce drawings & process schedules in accordance with the specification provided.
4. Prototype Manufacture - Prototypes are produced on the basis of these drawings, which help in developing the product & ascertaining that whether the product meets the specifications.
5. Development – It is the period of testing & changing of initial product manufactured till it meets the laid down specifications.
6. Tooling – If product meets the required specifications & is profitable it is tooled up for production i.e. building of production line, building expensive jigs & buying special purpose tools leading in very large initial investment.
7. Manufacture – Involves purchase of raw material & bought out components, arranging for labour & facilities for manufacture.
8. Selling & Distribution – Money is spend on campaign to sell the product & product is distributed to sales outlets & to customers.
9. After Sales Support – Ensuring availability of spares & expert servicing throughout life of product.
10. Decommissioning & replacement – After the life of the product, the plant used to produce the product is sold/scrapped/or disposed of in a manner, which is suitable.

LIFE CYCLE COSTING

As per **CIMA**, Life-Cycle Costing (also known as Whole Life Costing) is the practice of obtaining over their life-times, the best use of physical asset at the lowest total cost to the entity.

Life cycle costing (LCC), aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracks and accumulates the actual costs and revenues attributable to cost object from its inception to its abandonment.

Sometimes the terms, “cradle-to-grave costing” and “womb-to-womb costing” convey the meaning of fully capturing all costs associated with the product from its initial to final stages.

PRODUCT LIFE CYCLE COSTING

It is an approach used to provide a long term picture of product line profitability, feedback on the effectiveness of life cycle planning cost data to clarify the economic impact of alternatives chose in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. The thrust of product life cycle costing is on the distribution of costs among categories changes over the life of the product, as does the potential profitability of a product. Hence it is important to track and measure costs during each stage of a product's life cycle.

Features / Characteristics of Product Life Cycle Costing:

Product life cycle costing is important due to the following features:

1. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Costs and revenues can be analysed by time periods, but the emphasis is on costs and revenue accumulation over the entire life cycle for each product.

2. Product life cycle costing traces research and design and development costs, incurred to individual products over their entire life cycles, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods.

Life cycle costing therefore ensures that costs for each individual product can be reported and compared with product revenues generated in later periods. Hence the costs are made more visible.

Importance of Product Life cycle:

- (i) When non-production costs like costs associated with R & D, design, marketing, distribution and customer service are significant, it is essential to identify them for target pricing, value engineering and cost management. For example, a poorly designed software package may involve higher costs on marketing, distribution and after sales service.
- (ii) There may be instances where the pre-manufacturing costs like R & D and design are expected to constitute a sizeable portion of life cycle costs. When a high percentage of total life cycle costs are likely to be so incurred before the commencement of production, the firm needs an accurate prediction of costs and revenues during the manufacturing stage to decide whether the costly R & D and design activities should be undertaken.
- (iii) Many costs are locked in at R & D and design stages. Locked in or Committed costs are those costs that have not been incurred at the initial stages of R & D and design but that will be incurred in the future on the basis of the decisions that have already been taken. For example, the adoption of a certain design will determine the product's material and labour inputs to be incurred during the manufacturing stage. A complicated design may lead to greater expenditure on material and labour costs every time the product is produced. Life cycle budgeting highlights costs throughout the product life cycle and facilitates value engineering at the design stage before costs are locked in. Total life-cycle costing approach accumulates product costs over the value chain. It is a process of managing all costs along the value chain starting from product's design, development, manufacturing, marketing, service and finally disposal.

Benefits of Life cycle costing:

1. The life cycle concept results in earlier actions to generate revenue or to lower costs than otherwise might be considered.
2. Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
3. Life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.
4. The life cycle concept helps managers to understand acquisition costs vs. operating and support costs, i.e. to find a correct balance between investment costs vs. operating expenses.

Here are some of the most often cited LCC limitations:

1. It is not an exact science, everyone gets different answers and the answers are neither wrong nor right—only reasonable or unreasonable. LCC experts do not exist because the subjects are too broad and too deep.
2. It models operate with limited cost databases and the cost of acquiring data in the operating and support areas is both difficult to obtain and expensive to acquire.
3. It requires a scenario for: how the money expenditure model will be constructed for acquisition of equipment, how damage will occur, etc.—most details require extensive extrapolations and obtaining facts is difficult.
4. It results are not good budgeting tools. They're effective only as comparison/trade-off tools and producing good LCC results requires a project team approach because specialized expertise is needed.

Product Life Cycle Costing is considered important due to the following reasons:

1. **Time based analysis:** Life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their life cycle. Costs and revenues can be analysed by time periods. The total magnitude of costs for each individual product can be reported and compared with product revenues generated in later periods.
2. **Overall Cost Analysis:** Production costs are accounted and recognized by the routine accounting system. However non-production costs like R&D, design, marketing, distribution, customer service etc. are less visible on a product-by-product basis. Product Life Cycle Costing focuses on recognizing both production and non-production cost.

3. **Pre-production Costs analysis:** The development period for R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begins. Hence, the company needs accurate information on such costs for deciding whether to continue with the R&D or not.
4. **Effective Pricing Decisions:** Pricing Decisions, in order to be effective, should include market consideration on the one hand and cost considerations on the other. Product Life Cycle Costing and Target Costing help analyse both these considerations and arrive at optimal price decisions.
5. **Better Decision Making:** Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
6. **Long Run Wholistic view:** Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.
7. **Life Cycle Budgeting:** Life Cycle Budgeting. i.e. Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. The Company stands to benefit since costs are avoided before they are committed or locked in.
8. **Review:** Life cycle Costing provides scope for analysis of long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

Question 11: What is Target Costing and what are the stages to the methodology? (4 Marks) Nov./00

Answer: Target Costing: It is a management tool used for reducing a product cost over its entire life cycle. It is driven by external Market factors. Marketing management prior to designing and introducing a new product determines a target market price. This target price is set at a level that will permit the company to achieve a desired market share and sales volume. A desired profit margin is then deducted to determine the target maximum allowable product cost. Target costing also develops methods for achieving those targets and means to test the cost effectiveness of different cost-cutting scenarios.

Stages to the methodology.

1. **Conception (planning) Phase:** Under this stage of life cycle, competitors products are to be analysed, with regard to price, quality, service and support, delivery and technology. The features which consumers would like to have like consumer value etc. established. After preliminary testing, the company may be asked to pinpoint a market niche, it believes, is under supplied and which might have some competitive advantage.
2. **Development phase:** The design department should select the most competitive product in the market and study in detail the requirement of material, manufacturing process along with competitors cost structure. The firm should also develop estimates of internal cost structure based on internal cost of similar products being produced by the company. If possible the company should develop both the cost structures (competitors and own) in terms of cost drivers for better analysis and cost reduction.
3. **Production phase:** This phase concentrates its search for better and less expensive products, cost benefit analysis in different features of a product priority wise, more towards less expensive means of production, as well as production techniques etc.

Question 12: What is Product Life-cycle Costing? Describe its characteristics & benefits.

(5 Marks)Nov/04 & (5 Marks) June/09-NC

Question 13: What is total-life-cycle costing approach? Why is it important?

(4 Marks)May/06

Question 14: List the steps involved in target costing process with the help of a block diagram.

(6 Marks)Nov./06

Question 15: What is product life cycle costing? What are the costs that you would include in product life cycle cost?

(4 Marks)May/07

Question 16: What is Target Costing? It is said that implementation of the target costing technique requires intensive marketing research. Explain why intensive marketing research is required to implement target costing technique

(9 Marks)Nov./07

Question 17: Discuss, how target costing may assist a company in controlling costs and pricing of products.

(4 Marks)Nov./08

Answer: Target costing may assist control of costs and pricing of product as under:

1. Target costing considers the price that ought to be charged by a company to achieve a given market share.
2. Target costing should take life cycle costs in to consideration.
3. If there is a gap between the target cost and expected cost, ways and means of reducing or eliminating it can be explored.
4. The target cost may be used for controlling costs by comparison

Question 18: A company has the capacity of production of 80,000 units and presently sells 20,000 units at Rs.100 each. The demand is sensitive to selling price and it has been observed that every reduction of Rs.10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?

What should be the cost reduction scheme if at present 40% of cost is variable with same % of profit? If Rate of Return is 15%, what will be maximum investment at full capacity?

Question 19: Sterling Enterprises has prepared a draft budget for the next year as follows:

Quantity	10,000 units
Sales price per unit	30
Variable costs per unit: Direct Materials	8
Direct Labour	6
Variable overhead (2 hrs × Re. 0.50)	1
Contribution per unit	15
Budgeted Contribution	1,50,000
Budgeted Fixed costs	1,40,000
Budgeted Profit	10,000

The Board of Directors is dissatisfied with this budget, and asks a working party to come up with an alternate budget with higher target profit figures.

The working party reports back with the following suggestions that will lead to a budgeted profit of Rs. 25,000. The company should spend Rs. 28,500 on advertising, & put the target sales price up to Rs. 32 per unit. It is expected that the sales volume will also rise, inspite of the price rise, to 12,000 units.

In order to achieve the extra production capacity, however, the work force must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour is increased to Rs. 4. The hourly rate for variable overhead will be unaffected. Ascertain the target labour time required to achieve the target profit.

[Ans.: Time reduction p.u. 0.25 per hour]

Question 20 [ABC + Target Costing]: Computo Ltd. manufactures two parts 'P' and 'Q' for Computer Industry.

P : annual production and sales of 1, 00,000 units at a selling price of Rs. 100.05 per unit.

Q : annual production and sales of 50,000 units at a selling price of Rs. 150 per unit.

Direct and Indirect costs incurred on these two parts are as follows:

	(Rs. in thousand)		
	P	Q	Total
Direct Material cost (variable)	4,200	3,000	7,200
Labour cost (variable)	1,500	1,000	2,500
Direct Machining cost (See Note)*	700	550	1,250
Indirect Costs:			
Machine set up cost			462
Testing cost			2,375
Engineering cost			2,250
			16,037

Note: Direct machining costs represent the cost of machine capacity dedicated to the production of each product. These costs are fixed and are not expected to vary over the long-run horizon.

Additional information is as follows:

	P	Q
Production Batch Size	1,000 units	500 units
Set up time per batch	30 hours	36 hours
Testing time per unit	5 hours	9 hours

Engineering cost incurred on each product 8.40 lacs 14.10 lacs

A foreign competitor has introduced product very similar to 'P'. To maintain the company's share and profit, Computo Ltd. has to reduce the price to Rs. 86.25. The company calls for a meeting and comes up with a proposal to change design of product 'P'. The expected effect of new design is as follows:

- Direct Material cost is expected to decrease by Rs. 5 per unit.
- Labour cost is expected to decrease by Rs. 2 per unit.
- Machine time is expected to decrease by 15 minutes; previously it took 3 hours to produce 1 unit of 'P'. The machine will be dedicated to the production of new design.
- Set up time will be 28 hours for each set up.
- Time required for testing each unit will be reduced by 1 hour.
- Engineering cost and batch size will be unchanged.

Required:

(a) Company management identifies that cost driver for Machine set-up costs is 'set up hours used in batch setting' and for testing costs is 'testing time'. Engineering costs are assigned to products by special study. Calculate the full cost per unit for 'P' and 'Q' using Activity-based costing.

(b) What is the Mark-up on full cost per unit of P?

(c) What is the Target cost per unit for new design to maintain the same mark up percentage on full cost per unit as it had earlier? Assume cost per unit of cost drivers for the new design remains unchanged.

(d) Will the new design achieve the cost reduction target?

(e) List four possible management actions that the Computo Ltd. should take regarding new design.

[Ans.: (a) P –Rs. 87, Q- Rs. 146.74; (b) 15%; (c) Rs. 75; (d) No, as the cost of new design is Rs. 77.36 per unit.]

(16 Marks) May/06

Question 21[ABC + Target Costing]: IBM Ltd. Manufactures and sells computers peripherals to several retail outlets throughout the country. Amar is the manager of the printer division. Its two largest selling printers are P1 & P2. The manufacturing cost of each printer is calculated using IBM's activity based costing system. IBM has one direct manufacturing cost category (direct materials) and the following five indirect manufacturing cost pools.

Indirect manufacturing cost pool (Rs.)	Allocation Base	Allocation	Rate
1. Materials handling	No. of parts	Rs. 1.20 per part	
2. Assembly management assembly	Hours of assembly time	Rs. 40 per hour of time	
3. Machine insertion of parts machine	No. of machine inserted parts	Rs. 0.70 per inserted part	
4. Manual insertion of parts manually	No. of manually inserted parts	Rs. 2.10 per inserted part	
5. Quality testing hour.	Hours of quality testing time	Rs. 25 per testing	

Product characteristics of P1 and P2 are as follows:

Product	P1	P2
Direct materials costs	Rs. 407.50	Rs. 292.10
Number of parts	85	46
Hours of assembly time	3.2	1.9
Number of machine – inserted parts	48	31
Number of manually inserted parts	36	15
Hours of quality testing time	1.4	1.1

A foreign competitor has introduced products very similar to P1 and P2. Given their announced selling prices and to maintain his company's market share and profits, Amar estimates the P1 to have manufacturing cost of approximately Rs. 680 and P2 to have a manufacturing cost of approximately Rs. 390. He calls a meeting of product designers and manufacturing personnel at the printer division. They all agree to have the Rs. 680 and Rs. 390 figures become target costs for designed version of P1 and P2 respectively. Product designers examine alternative ways of designing printer with comparable performance but lower costs. They come up with the following revised designs for P1 and P2 (termed P1 – REV and P2 – REV, respectively)

Particulars	P1 – REV	P2 – REV
Direct materials cost	Rs. 381.20	Rs. 263.10
Number of parts	71	39
Hours of assembly time	2.1	1.6
Number of machine – inserted parts	59	29

Number of manually – inserted parts	12	10
Hours of quality testing time	1.2	0.9

Required:

- Compute the present costs of products P1 and P2 using ABC system.
- Compute the manufacturing costs of P1 – REV and P2 – REV. How do they compare with the Rs. 680 and Rs. 390 target costs?

(RTP-May/05, May/07, Nov./07 & Nov./08-Old Course)

[Ans.: P1: Present Cost-Rs. 781.70, Estimated Cost-Rs. 646.90 & Target Cost-Rs. 680; P1: Present Cost-Rs. 504.00, Estimated Cost-Rs. 437.70 & Target Cost-Rs. 390]

Question 22 [Life Cycle Costing]: Indo Gulf Fertilizers Ltd. Supports the concepts of the terotechnology of life cycle costing for new investment decisions covering its engineering activities .The finalized of the philosophy is now well established and its principles extended to all other areas of decision making.

The company is to replace a number of its machines and the Production Manager is to run between the 'X' machine, a more expensive machine with a life of 12 years, and the 'W' machine .The pattern of maintenance and running costs differs between the types of machine and relevant data are shown below:

	(Rs.)	X	W
Purchase price		19,000	13,000
Trade –in-value		3,000	3,000
Annual repair costs		2,000	2,600
Overhaul costs (p.a)		4,000	2,000
Estimated financing costs averaged over machine life (p.a)		10%	10%

You are required to recommend, with supporting figures, which machine to purchase, stating any assumptions made.

[Ans.: Machine X-Life 12 years: Annualized equivalent is Rs. 4,925/- & Machine W-Life 12 years: Annualized equivalent is Rs. 5,508/-; Recommendation: Purchase machine 'X']

Question 23 [ABC+Life Cycle Costing]: Activities have been identified and the budget quantifies for the three months ended 31 March,2001 as follows:-

Activities	Cost Driver Unit Basis	Units of Cost Driver	Cost (Rs.000)
Product Design	Design hours	8000	2000(see note 1)
Purchasing	Purchase order	4000	200
Production	Machine hours	12000	1500(See note 2)
Packing	Volume (Cu.m.)	20000	400
Distribution	Weight (Kg.)	120000	600

Note1: This includes all design costs for new products released this period.

Note 2: This includes a depreciation provision of Rs.300000 of which Rs.8000 applies to 3 months depreciation on a straight-line basis for a new product (NPD).The reminder applies to other products.

New product NPD is included in the above budget. The following additional information applies to NPD.

- (1) Estimated total output over the product life cycle:5000 units(4 years life cycle)
- (2) Product design requirement: 400 design hours.
- (3) Output in quarter ended 31 March 2001:250 units.
- (4) Equivalent batch size per purchase order: 50 units.
- (5) Other product unit data: production time 0.75 machine hours: volume 0.4 cu. Meters: weight 3 Kg .

Required:-

Prepare a unit overhead cost for product NPD using an activity based approach which includes an appropriate share of life cycle costs using the information provided.

[Ans.: Total cost is Rs. 14.60]

Question 24 [Life Cycle Costing]: A housewife is looking at ways of producing domestic hot water and considers possibility an electric immersion heater having an installation cost of Rs. 160 and estimated annual electrical charges of Rs. 200, and a gas boiler with an installation cost of Rs. 760 with fuel bills of Rs. 80.

Assuming yourself as a consultant to this cost-conscious-housewife, advise her suitably by comparing-two systems, on the basis of (i) total expenditure, and (ii) present value, over a 5-year period. Take interest at 9 per cent.

What will be your recommendation if you consider both the equipments for a 8 years period?

[Ans.: Total cost-5 Years:-> Heater: Rs. 1160, Boiler: Rs. 1160; 8 Years:-> Heater: Rs. 1760, Boiler: Rs.1400; Present Value- 5 Years:-> Heater: Rs. 938, Boiler: Rs. 1071; 8 Years:-> Heater: Rs. 1267, Boiler: Rs.1203]

Question 25 [Life Cycle Costing]: Gemini enterprises currently makes as many units of part No. X-248 as it needs. Sen, general manager of Gemini enterprises, has received a quotation from another company for making part No. X-248. Zedco will supply 1,000 units of parts No. X-248 per year at Rs. 50 per units. Zedco can begin supply on 1st July, 2000 and continue for 5 year, after which Gemini will not need the part. Zedco can accommodate any change in Gemini's demand for the part and will supply it for Rs. 50 regardless of quantity.

Shah, the controller of Gemini enterprises, reports the following costs for manufacturing 1,000 units of part No. X-248:

	Rs.
Direct materials	22,000
Direct labour	11,000
Variable manufacturing overhead	7,000
Depreciation on machine	10,000
Product and process engineering	4,000
Rent	2,000
Allocation of general plants overhead costs	5,000
Total cost	<u>61,000</u>

The following additional information is available:

- part X-248 is made on a machine used exclusively for its manufacture. The machine was acquired on 1st July, 2001 at a cost of Rs. 60,000. The machine has a useful life of six year and a zero terminal disposal price. Depreciation is calculated on straight-line basis.
- The machine could be sold today for Rs. 15,000.
- Product and process engineering costs are incurred to ensure that the manufacturing process for part No. X-248 works smoothly. Although these costs are fixed in the short run, with respect to units of part No. X-248, they can be solved in the long run if part No. X-248 is no longer product. If part No. X-248 is outsourced, product and process engineering costs of Rs. 4,000 will be incurred for 2001-02 but not thereafter.
- Rent costs of 2,000 are allocated to products on the basis of the floor space used for manufacturing the product. If part number X-248 is discontinued, the space currently used to manufacture it would become available. The company could then use the space for storage purpose and saves Rs. 1,000 currently paid for outside storage.
- General plant overhead costs are allocated to each department on the basis of direct manufacturing labour costs. The costs will not change in total. But no general plant overhead will be allocated to part number X-248 if the part is outsourced.

Assume that Gemini requires a 12% rate of return for this project. The following may be useful:

Year	Present value factor at 12%
0	1.000
1	0.893
2	0.797
3	0.712
4	0.636
5	0.567

Required:

- Should part No. X-248 be outsourced? prepare a quantitative analysis.
- State any sensitivity analysis that seems to be advisable. Do not perform any sensitivity calculations.
- Sen is particularly concerned about his bonus for 2001-02. The bonus is based on accounting income of Gemini enterprises. What decision will Sen make if he wants to maximize his bonus for 2001-02?

[Ans.: NPV is Rs. (3025), so it is desirable to manufacture the part internally]

Question 26 [Life Cycle Costing]: S engineering company is considering to replace or repair a particular machine, which has just broken down. Last year this machine cost Rs. 20,000 to run and maintain. These costs have been increasing in real terms in recent years with the age of the machine. A further useful life of 5 year is expected, if immediate repair of Rs. 19,000 are carried out. If the machine is not repaired it can be sold immediately to realize about Rs. 5,000 (ignore loss/gain on such disposal).

Alternatively, the company can buy a new machine for Rs. 49,000 with an expected life of 10 year with no salvage value after providing depreciation on straight line basis. In this case, running and maintenance cost will reduce to Rs. 14,000 each year and are not expected to increase much in real term for a few years at least. S engineering company regard a normal rate of 10% p.a. after tax as a minimum requirement on any new investment. Considering capital budgeting techniques, which alternative which you choose? Take

corporate tax rate of 50% and assume that depreciation on straight line basis will accepted for tax purpose also.

Given cumulative present value of Re. 1 p.a. at 10% for 5 year Rs. 3.791, 10 year Rs. 6.145.

[Ans: Present value of cash outflow: Alt I – Rs. 12506; Alt II – Rs. 11710]

PRICING DECISIONS & PARETO ANALYSIS

PRICING OF FINISHED PRODUCT:

I. Cost Plus pricing:

It is the most widely used method of pricing a product as it ensures that the selling price is greater than the total cost of a product. This method helps business firms to generate profits and survive in the future.

Under cost plus pricing the selling prices of a product are determined based on its estimated cost plus a fixed profit margin. Here 'cost' means full cost at current output and wage levels since these are regarded as most relevant in price determination.

The unit cost of the product can be determined by using different methods viz. total cost, manufacturing cost or variable / incremental cost. The percentage of mark up to be added to estimated cost also vary and depends upon the cost figures used.

Cost Determination: For cost determination purposes, the following principles are adopted:

1. **Cost Classification:** Costs may be classified into:
Manufacturing, Administration and Selling & Distribution Costs; (Under Absorption costing) or Variable and Fixed Costs (Under Marginal costing)
2. **Size of the unit and scale of operations:**
Small manufacturers: An individual manufacturer may take his cost of production into account and arrive at a price at which the products are to be sold in the concerned region.
Medium and large manufacturers: A manufacturer having several factories all over the country may determine the weighted average cost of the factories so as to arrive at a uniform ex-factory price for the country as a whole. If commodities are in short supply, high cost of individual units may have to be allowed in the price. However, in the case of high cost producers, the profit element may have to be reduced to encourage them to reduce their costs.
3. **Uniform costing for whole industry:**
The price may be fixed after taking into account the cost or representative unit from the industry, which may fall within the range of lowest cost unit and highest cost unit.
The factories in the industry may be classified into (i) Small size (ii) Medium Size; and (iii) Large size. Representative samples are drawn and costs are determined by reference to the distribution of the factories. For example, the costs of medium size factories can be taken into account if this group forms the greater part of the industry.
4. **Determination of Fixed costs:**
Variable costs can be easily determined on a per unit basis. However, fixed costs per unit will have to be ascertained with informed judgment.
Fixed cost per unit should normally be based on the level of production and capacity utilization likely to be achieved, i.e. Normal Capacity or Capacity based on Sales expectancy.
Any assumption of low utilization may result in over estimating the cost. Conversely, a high utilization assumption may result in under estimating the cost.

It is therefore, desirable that the level of production and capacity utilization, which are likely to apply in the near future, should be arrived at with utmost care on realistic basis keeping in view both the past performance and the future demand.

5. Depreciation:

If a firm wants to survive and stay in business, it has to maintain its fixed capital intact so that its fixed assets may be replaced at the end of their useful working life out of the funds generated from profits retained in the business.

In a period of relatively stable price levels, depreciation based on historical cost of fixed assets would be adequate for achieving this object.

In periods when the price level is continuously changing, the firm may not be left with adequate funds generated out of accumulated depreciation at the end of the life of the plant to replace it at a higher price.

Hence depreciation should be properly included as part of cost so as to leave sufficient profits for asset replacement.

Advantages of Cost plus pricing

1. **Guaranteed Contribution:** When full costs plus basis is used for pricing, the firm earns a guaranteed contribution equivalent to fixed costs plus profit margin. Even, profit margin is taken as nil, fixed costs included in prices will guarantee minimum contribution.
2. **Assured Profit:** Cost plus is a fair method of price fixation. The business executives are convinced that the price fixed will cover the cost.
3. **Reduced risks and uncertainties:** If price is greater than cost, the risk is covered. This is true when normal expected capacity basis of cost estimation is used. The decision- maker may accept a pricing formula that seems reasonable for reducing uncertainty.
4. **Most suitable in long run:** Cost plus pricing is ideal in the long run since there are no permanent opportunity costs. The effect of seasonal fluctuations is ironed out and prices are established based on normal long run costs.
5. **Considers market factors:** Cost plus pricing does not mean that market forces are ignored. The mark up added to the cost to make a price reflect the well-established customs of trade, which guide the price fixer towards a competitive price.
6. **Full Recovery of all costs of the product:** For long-run pricing decisions, full costs of the product informs managers of the minimum costs to be recovered so as to continue in business rather than shut down.
7. **Price Stability:** Price fixation based on full costs of the product promotes price stability, because it limits the ability of sales person to cut prices. Price stability facilitates planning.
8. **Simplicity:** A full cost formula for pricing does not require a detailed analysis of cost- behaviour patterns to separate costs into fixed and variable components for each product. It is simple to operate.

Disadvantages of Cost plus pricing

1. **Ignores demand:** Cost plus pricing ignores demand and fails to take into account the buyers' needs and willingness to pay, which govern the sales volume obtainable at each series of prices.
2. **Ignores competition:** It fails to reflect competition adequately.
3. **Arbitrary Cost allocation:** It assumes that the costs have been estimated with exact accuracy. This assumption is not true particularly in multi-product firms where the common costs are allocated arbitrarily.
4. **Ignores opportunity costs:** For many decisions incremental cost plays a vital role in pricing, rather than full costs. This aspect is ignored. Also opportunity costs, most relevant for decision-making are summarily ignored.
5. **Price-Volume relationships:** Since the fixed overheads are apportioned on the basis of volume of production, the cost will be more if sales volume is less and vice-versa. The increase or decrease in sales volume is dependent on price. Thus it is a vicious circle- cost plus mark up is based on sales volume & sales volume is based on price.

II. Rate of Return Pricing

Rate of return pricing is used when each division is treated as an Investment Centre. Determination of return on capital employed is one of the most crucial aspects in price fixation and performance evaluation of Investment Centres. The firm should determine an average mark-up on cost, which is necessary to produce a desired rate of return on its investment.

The issues to be considered are:

- ✓ Basis on which the capital employed is computed Components to be covered in the return on capital Fairness of the rate or return.
- ✓ The fairness of the rate of return varies from industry to industry and from time to time and is primarily dependent on the risks involved. In following fair rate of return, the desirability of earning adequate profits to plough back into business should be kept in mind.

- ✓ It would be correct to assume that allowing the industry to earn adequate return on the capital employed would attract additional capital and increase the number of factories and production of all commodities which must ultimately lead to competition and reduction in costs and prices.

III. Variable Costs Pricing:

Selling prices are fixed above variable costs in order to generate contribution. However, in the short run, selling prices may be equal to variable cost or sometimes even below variable cost. Some illustrative situations are:

- Products / Materials are perishable in nature. Launch of new product at competitive prices.
- Sales of old and defective stocks, seconds sales, etc.
- Disposal of accumulated stocks, where market prices have fallen (to save carrying costs)
- Sale of one product with reduced margin, to boost sales of other products having higher profit margin.

IV. Pricing above marginal cost, but below total cost.

In periods of recession, a firm may sell its articles at a price less than the total cost but above the marginal cost for a limited period. The advantages of this policy arise due to avoidance of shut-down. Thus the benefits are:

1. The firm can continue to produce and use the services of skilled employees who are well trained and will be difficult to re-employ later if discharged.
2. Plant and machinery can be prevented from deterioration through idleness.
3. The firm would be ready to take advantage of improved business conditions later. The firm can continue in the market and reduce loss of market share to Competitors.

Such pricing policy is necessarily **restricted to the short run**. When business conditions improve in the long run, such pricing below total cost but above marginal costs is not advisable.

V. Differential selling prices:

Use of differential selling price, which is above marginal cost but below total cost is primarily intended to absorb surplus capacity. It can be achieved in any of the following ways:

- **Different Markets – Export Pricing:** The firm producing a branded article may use the surplus capacity to produce the same article to be sold above variable cost in a different market, e.g. export sales. The articles sold in the home market will recover all fixed expenses. Since price reduction in the home market is injurious to the normal sales, it is not resorted to. Any reduction in the selling prices in the export market will not affect the price prevailing in the home market.
- **Different products:** The firm may produce and sell one product, which covers the entire fixed overheads and use the surplus capacity to produce another product, which may be sold at a price above its marginal cost. The overall profitability will thus increase. The manufacture of the second product should be confined to surplus capacity and it should not have the possibility of becoming a major product at the low price at which it is sold. If it becomes so, there will be a reduction in profit.

VI. Competitive Pricing:

When a company fixes its price mainly on the consideration of what its competitors are charging, its pricing policy is called Competitive Pricing or competition-oriented pricing.

The company need not charge the same price as charged by its competitors. But under such a pricing method the Company keeps its prices lower or higher than its competitors by a certain percentage.

Competitive price so determined does not maintain a rigid relation between its price, cost or demand.

The Company's own costs or demand may change, but it will maintain its price because its competitors maintain their prices. Conversely, the Company will change its price when its competitors change their price, even if its own costs or demand have not altered.

The different types of competitive pricing are

- Going rate pricing
- Sealed bid pricing

VII. Incremental pricing:

Incremental pricing involves comparison of the impact of decisions on revenues and cost. If a pricing decision results in a greater increase in revenue than costs, it is favourable. It also means that consideration is being given to other objectives of the business. Thus profitability can be set as the matter of primary consideration and then the decision can be adjusted to bring it in consonance with the other decision of the business.

Incremental pricing analyses all aspects of decision-making as listed below:

Relevant Cost Analysis: This technique considers changes in costs rather than in average cost. Overhead allocations are irrelevant. Incremental revenue inflows and cost outflows are included for decision-making.

Product-Line Relationship Analysis: This technique necessitates consideration being given to possible complementary relations in demand. Sale of one product may lead to the sale of a complementary product. This overall effect on profitability has to be evaluated.

Opportunity Cost Analysis: the incremental revenue should cover the opportunity cost and also generate surplus. A price which results in an incremental revenue which in turn merely covers the incremental costs is not sufficient. If the opportunity foregone is greater than incremental revenue, the decision is not sound.

Time Factor Analysis: The decision should take into account the short run and long run effects. A high price may increase its immediate profits but may lead to loss of revenue in the long run owing to competitors snatching the business.

CVP Analysis: In fixing prices, consideration should be given to price volume relationship.

The responsiveness of the market to the price should be such that the volume is increased to achieve full utilization of plant capacity.

Risk Analysis: Consideration should also be given to the evaluation of uncertainty and risk factor. The decision taken should be able to maximize the expected value based on probability theory.

VIII. New Product Pricing:

New Product Pricing is generally a difficult decision because of the uncertainty involved in the estimation of their demand. For determining optimal prices, the following procedure may be adopted by a firm.

Market Survey: Experimental sales are conducted in different markets using different prices to see which price is suitable. For example, choose three different markets and by using the same amount of sales promotional activities, ascertain what is the right price.

Price Volume Relationship: The relationship between price and volume should be ascertained, using the concept of elasticity of demand. The extent of volume increase due to price reduction and vice-versa, can be reasonably quantified through such analysis.

Incremental Contribution Approach: For decision making, the firm should adopt the incremental contribution approach i.e. additional total contribution from additional sales quantity. The firm can increase its prices as long as there is further incremental contribution. Such analysis may prove that the highest prices yielding the largest unit contributory margin need not necessarily maximize the profits. A lower price may well go to maximize the profits.

PRICING STRATEGIES

Pricing strategy is defined as a broad plan of action by which an organization intends to reach its goal. Some illustrative strategies are:

- Expanding product lines that enjoy substantial brand equity.
- Offer Quantity discounts to achieve increase in sales volume.

Some types of pricing strategies, which a firm can adopt are:

- **Market entry Strategies** – New Product Pricing – Skimming or penetration Pricing
- **Discount Strategies** – Differentials and discounts to Dealers, Distributors and Customers etc.
- **Price Discrimination Strategies** – based on customers, time, product version etc. Geographic Pricing Strategies

A. Skimming Pricing Strategy:

It is a policy of high prices during the early period of a product's existence and in the later years the prices are gradually reduced. It is an attempt to exploit those segments of the market that are relatively insensitive to price changes. For example, high initial price may be charged to take advantage of the novelty appeal of a new product when the demand is initially inelastic. It offers a safeguard against unexpected future increase in costs, or a large fall in demand after the novelty appeal has declined. This policy should not be adopted when the substitutes are already available in the market.

The reasons for following such a policy are:

1. **Inelastic Demand:** The demand is likely to be inelastic in the earlier stages till the product is established in the market. The firm can take advantage of high prices.
2. **Sales Boost:** The change of high price in the initial periods serves to skim the cream of the market that is relatively insensitive to price. The gradual reduction in price in the later years will tend to increase the sales.

3. **Assured Profit:** This method is preferred in the beginning because in the initial periods when the demand for the product is not known the price covers the initial cost of production. Contribution is guaranteed.
4. **Cost Revenue Matching:** High initial capital outlays, needed for manufactures, results in high cost of production. Also, the manufacturer has to incur huge promotional activities resulting in increased costs. High initial prices will be able to finance the cost of production. Gradually, the economies of scale and savings in costs are passed on to customers.

B. Penetration Pricing Strategy

It is a policy of using a low price as the principal instrument for penetrating mass markets early.

This method is used for pricing a new product and to popularize it initially.

Profits may not be earned in the initial stages. However, prices may be increased as and when the product is established and its demand picks up.

The low price policy is introduced for the sake of long-term survival and profitability and hence it has to receive careful consideration before implementation. It needs an analysis of the scope for market expansion and hence considerable amount of research and forecasting is necessary before determining the price.

The circumstances in which penetrating Pricing can be adopted are:

1. **Elastic demand:** The demand of the product is high, when price is low. Hence lower prices mean large volumes and hence more profits.
2. **Mass Production:** When there are substantial savings in large-scale production, increase in demand is sustained by the adoption of low pricing policy.
3. **Frighten off competition:** The prices fixed at a low level act as an entry barrier to the prospective competitors. The use of this policy by existing concerns will discourage the new concerns to enter the market. This pricing policy is also known as "stay-out-pricing"

PARETO ANALYSIS

PARETO ANALYSIS is a rule that recommends focus on the most important aspects of the decision making, in order to simplify the process of decision –making.

It is based on the 80:20 phenomenon, first observed by Vilfredo Pareto, an Italian economist.

He noticed that 80% of the wealth of Milan was owned by 20% of its citizen. This pattern of 80:20 or approximations like 70:30 can be observed in many different business situations.

The management can use it in a number of different circumstances to direct management attention to the key control mechanism or planning aspect. It helps to clearly establish top priorities and to identify both profitable and unprofitable targets.

Usefulness of Pareto Analysis: Pareto analysis is useful to

1. Prioritize problems, goals and objectives. Identify root causes
2. Select and define key quality improvement programs. Select key customer relations and service programs. Select key employee relations improvement programs.
3. Select and define key performance improvement programs. Maximize research and product development time.
4. Verify operating procedures and manufacturing processes
5. Sales/distribution of Products or services.
6. Allocate physical, financial and human resources.

Situations where Pareto Analysis can be applied:

Pareto analysis is applicable in the presentation of Performance Indicators data through selection of representative process characteristics that truly determine or directly or indirectly influence or conform the desired quality or performance result or outcome. It is generally applicable to the following business situations:

1. **Product Pricing**
 - Where a company sells a number of products, it may not be possible to analyse cost- volume- price- profit relationships for all products.
 - Pareto Analysis is used for analyzing the firm's estimated sales revenues from various products and it might indicate that approximately 80% of its total sales revenue is earned from about 20% of its products.

- This helps top management to delegate the pricing decision for approximately 80% of its products to the lower managerial levels. Top management can concentrate on pricing decisions for the important 20% products, which are essential for the company's survival.
 - Sophisticated pricing methods can be adopted for the important products while for other products cost based pricing methods may be used.
2. **Customer profitability Analysis:**
- The modern business thinking is to recognize the customer and satisfy his requirements. Hence instead of analyzing products, customers can be analysed for their relative profitability to the organization.
 - It is often found that approximately 20% of customers generate 80% of the profits.
 - Such analysis is useful for evaluation of the portfolio of customer profile, and decision making such as whether to continue serving a customer group, what is the extent of promotion expenses to be incurred etc.
3. **ABC Analysis – Stock Control:**
Raw material stock control, it is found that only a few of the goods in stock make up most of the value. About 70% of the materials value is due to high priced materials which constitute only 20% of the quantity.
These materials are classified into A, B and C categories based on their importance. Control is directed primarily over 'A' category items by setting EOQ, Stock levels, Surprise Stock Verification procedures etc.
The outcome of such analysis is that by concentrating on small proportion of stock items that jointly accounts for 80% of the total value, a firm will be able to control most of the monetary investment in stocks.
4. **Activity Based Costing**
Activity Based Costing involves the identification of cost drivers for various items of Overhead expenses. Generally, 20% of the firm's cost drivers are responsible for 80% of the total cost.
By analyzing, monitoring and controlling those cost drivers that attribute to high costs, a better control and understanding of overhead will be obtained.
5. **Quality Control**
- Pareto analysis can be extended to discover from an analysis of defect report or customer complaints which 'vital few' causes are responsible for most of the reported problems.
 - Generally 80% of reported problems are traceable to 20% of the underlying causes. By concentrating one's efforts on rectifying the vital 20%, one can have the greatest immediate impact on product quality.
 - Pareto Analysis indicates how frequently each type of failure (defect) occurs. The purpose of the analysis is to direct management attention to the areas where the best return can be achieved by solving most of quality problems, perhaps just with a single action.

Question 27: Enumerate the circumstances which are favourable for the adoption of a penetrating pricing policy. (4 Marks) May/99, (4 Marks) May/01 & (3 Marks) May/04

Question 28: Outline the features of penetration pricing strategy (6 Marks) Nov./06

- Ans.: (i)** Penetration Pricing: It is a policy of using a low price as the principal instrument for penetrating mass markets early.
- (ii)** This method is used for pricing a new product and to popularize it initially.
- (iii)** Profits may not be earned in the initial stages. However, prices may be increased as and when the product is established and its demand picks up.
- (iv)** The low price policy is introduced for the sake of long term survival and profitability and hence it has to receive careful consideration before implementation. It needs an analysis of the scope for market expansion and hence considerable amount of research and forecasting are necessary before determining the price.
- (v)** The circumstances in which penetrating pricing can be adopted are:
- Elastic demand:** The demand of the product is high when price is low. Hence, lower prices mean large volumes and hence more profits.
- Mass Production:** When there are substantial savings in large-scale production, increase in demand is sustained by the adoption of low pricing policy.
- Frighten off competition:** The prices fixed at a low-level acts as an entry barrier to the prospective competitors. The use of this policy by existing concerns will discourage the new concerns to enter the market. This pricing policy is also known as "stay-out-pricing".

Question 29: Explain the concept of cost plus pricing. What are its advantages and disadvantages?

(8 Marks) May/00

Question 30: State the merits of cost-plus contracts.

(3 Marks) May/04

Question 31: Describe two pricing practices in which non-cost reasons are important, when setting prices.

(3 Marks) Nov/00

Ans.: Two pricing practices in which non-cost reasons are important when setting price are:

(i) Price discrimination and (ii) Peak load pricing.

(i) Price discrimination: This is the practice of charging to some customers a higher price than that charged to other customers e.g. Airlines tickets for business travellers and LTC travellers are priced differently.

(ii) Peak load pricing: This pricing system is based on capacity constraints. Under this pricing system a higher price for the same service or product is demanded when it approaches physical capacity limits e.g. telephones, tele-communication, hotel, car rental and electric utility industries are charged higher price at their peak load.

Question 32: What is 'Price Skimming Policy' and at what situation it should be exercised.

(3 Marks) May/02 & (4 Marks) Nov./04

Question 33: How Pareto analysis is helpful in pricing of product in the case of firm dealing with multi-products?

(3 Marks) Nov./05

Question 34: What is Pareto Analysis? Name some applications.

(5 Marks) May/08

Question 35: Explain the usefulness of Pareto analysis and its application to business situations.

(4 Marks) Nov./03

Question 36: Explain different types of Competitive pricing?

(4 Marks) May/05

Question 37: (a) State the general guidelines to be used in adopting a pricing policy in a manufacturing organization.

(3 Marks) Nov./08-Old Course

(b) Enumerate the uses of Pareto Analysis.

(3 Marks) Nov./08-Old Course

Question 38: (PARETO ANALYSIS): In the table below the level of retail sales (Rs.'000) and closing stock (Rs '000) for the last trading year are given for two pharmacies (A and Z) operated by XYZ Ltd.

Category	Sales		Stock	
	A	Z	A	Z
OTC medicine and healthcare	175	120	35	40
Toiletries	150	100	60	65
Photographic	125	60	20	12.5
Food / Drink	100	75	20	20
Baby- Care	50	25	10	5
Sanitary products	50	25	10	5
Foot Care	30	20	2	5
Cosmetics etc	25	30	40	45
Hair care	25	10	10	5
Perfumery	20	10	10	7.5
Other	50	25	13	5
Total	800	500	230	215

Required: Prepare a Pareto analysis for the following.

(1) The retail shop sales data.

(2) The stock data for A and Z.

[Ans.: XYZ Ltd.

Sales in X (rearranged for the purpose of ranking)

Rank	Category	Stock(Rs.'000)	Cum. Sales(Rs.'000)	%
1	OTC	175	175	21.9
2	Toiletries	150	325	40.6
3	Photo	125	450	56.3
4	Food/ Drink	100	550	68.8
5	Baby	50	600	75.0
5	San. Prod.	50	650	81.3
5	Other	50	700	81.3

8	Foot Care	30	730	91.3
9	Cosmetics	25	755	94.4
10	Hair-care	25	780	97.5
11	Perfume	20	800	100.0

Stock in X (rearranged for the purpose of ranking)

Rank	Category	Stock(Rs.'000)	Cum. Sales(Rs.'000)	%
1	Toiletries	60	60	26.1
2	Cosmetics	40	100	43.5
3	OTC	35	135	58.7
4	Photo	20	155	67.4
4	Food/ Drink	20	175	76.1
6	Other	13	188	81.7
7	Baby	10	198	86.1
7	San. Prod.	10	208	90.4
7	Hair	10	218	94.8
7	Perfume	10	228	99.1
11	foot care	2	230	100.0

Sales in Z (Rearranged for ranking)

Rank	Category	Stock(Rs.'000)	Cum. Sales(Rs.'000)	%
1	OTC	120	120	24
2	Toiletries	100	220	44
3	Food/ Drink	75	295	59
4	Photo	60	355	71
5	Cosmetics	30	385	77
6	Baby	25	410	82
6	San. Prod.	25	435	87
6	Other	25	460	92
9	Foot care	20	480	96
10	Hair	10	490	98
11	Perfume	10	500	100

Sales in Z (Rearranged for ranking)

Rank	Category	Stock (Rs.'000)	Cum. Sales(Rs.'000)	%
1	Toiletries	65	65	30.2
2	Cosmetics	45	110	51.2
3	OTC	40	150	69.8
4	Food/ Drink	20	170	79.1
5	Photo	12.5	182.5	84.9
6	Perfume	7.5	190	88.4
7	Baby	5	200	93.0
7	San. Prod.	5	200	93.0
7	foot care	5	205	95.3
7	Hair	5	210	97.7
7	Other	5	215	100.0

BALANCE SCORECARD & BENCHMARKING

Balanced Score Card:

Balanced Score Card is a set of financial and non-financial measures relating to a company's critical success factors.

It is an approach advocated by Kaplan & Norton, which provides information to management to assist in strategic policy formulation and achievement.

The main objective of Balanced Score Card is to provide a comprehensive framework for translating a firm's strategic objectives into a coherent set of performance measures.

Advantages of Balanced Score Card:

1. **Wholistic approach:** It brings strategy and vision as the center of management focus. It helps companies to assess overall performance, improve operational processes and enable management to develop better plans for improvements. It provides management with a comprehensive picture of business operations.
2. **Overall Agenda:** It brings together in a single management report many of the seemingly desperate elements like customer oriented, shortening response time, improving quality etc. of competitive agenda.
3. **Objectivity:** It emphasizes the need to provide the user with a set of information, which addresses all relevant areas of performance in an objective and unbiased manner.
4. **Management By Objectives:** The methodology of balanced score card facilitates communication and understanding of business goals and strategies at all levels of an organization. Thus it enables management by objective.
5. **Feedback and Learning:** It provides strategic feedback and learning. The Balanced Score Card guards against subordination. It emphasizes an integrated combination of traditional and non-traditional performance measures.
6. **System Approach:** It help senior manages to consider all important performance measure together and allows them to see whether an improvement in one area has been achieved at the expense of another.

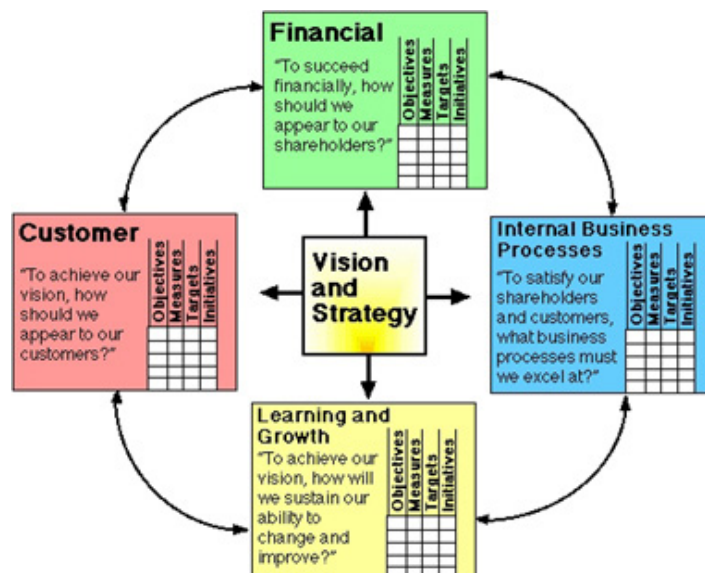
Components of a balanced score card:

A well designed balanced score card combines financial measures of past performance with measures of firm's drivers of future performance.

The specific objectives and measures of an organisation's balanced score card are derived from the firm's vision and strategy.

Generally, the balanced score card has the following perspectives from which a company's activity can be evaluated.

1. **Customer perspective** i.e how customers see us? In order to translate effective internal processes into organization success, customers/clients must be happy with the service they receive. The Customer perspective considers the business through the eyes of the customers, measuring and reflecting upon customer satisfaction.



2. **Internal perspective** i.e. in what must the organization excel? The internal perspective focuses attention on the performance of the key internal processes, which drive the business. The nature of the processes is dependent on the nature of the organization.
3. **Innovation and learning perspective**, i.e Can we continue to improve and create value? The value & Growth perspective is a measure of potential future performance – it direct attention to the basis of all future success – the organization people and infrastructure. Adequate investment in these areas is critical to all long-term success.

4. **Financial, perspective** i. e. How we look to our shareholders? The financial perspective measures the results that the organisation delivers to its shareholders.

Thus, the scoreboard provides a view of an organization's overall performance by integrating financial measures with other key performance indicators. All these four perspectives provide a balanced view of the present and future performance of the business.

Process of creating a Balanced Score Card:

Step	Description
1.	Identify the vision i.e. where an organization is going. For example, the vision of a company may be to dominate the market.
2.	Identify the organisation's strategies i.e. how an organization is planning to go there. For example, strategy may be to focus on cost efficiency, high quality and fresh investment in new technology.
3.	Define critical success factors and perspective i.e. what we have to do well in each perspective (see Note Below for illustration of perspectives and performance measures)
4.	Identify measures , which will ensure that every thing is going in the expected way.
5.	Evaluation of Balanced score card i.e. ensuring what we are measuring is right
6.	Create action plans and plan reporting of the Balanced Score Card
7.	Follow-up and manage i.e. which person should have reports and how reports should look like

A. Customer Perspective

Goals	Performance
Price	Competitive price
Delivery	Number of on time delivery, lead time from receipt of order to delivery to customers.
Quantity	Own quality relative to industry standards, number of defects or defect level
Support	Response time, customer satisfaction surveys

B. Internal business Perspective

Goals	Performance
Efficiency of manufacturing process	Manufacturing cycle time
Sales penetration	Annual sales vs. Plan sales, increase in number of customers in a unit of time.
New Product introduction	Rate of new product introduction/quarter

C. Innovation and Learning Perspective

Goals	Performance
Technology leadership	Product performance compared to competitors, number of new products with patented technology.
Cost leadership	Manufacturing overheads per quarter as a percentage of sales rate of decrease in cost of quality per quarter
Market leadership	Market share in all major markets
Research and development	Number of new products, numbers of patents

D. Financial Perspective

Goals	Performance
Sales	Revenue and profit Growth
Cost Of Sales	Extent to which it remained fixed or decreased each year
Profitability	Return on capital employed
Prosperity	Cash Flow

Bench Marking

- Benchmarking is the process of identifying and learning from the best practices anywhere in the world.
- It is a powerful tool for continuous improvement in performance.

- It involves comparing firm's products, services or activities against other best performing organization, either internal or external to the firm. The objective is to find out how the product, service or activity can be improved and ensure that the improvements are implemented.
- It attempts to identify an activity that needs to be improved and finding a non-rival organization that is considered to represent world-class best practice and studying how it performs the activity.

Different types of Bench marking:

1. **Competitive Bench marking:** It involves the comparison of one's own products, processes and business results with that of competitors. Bench marking partners are drawn from the same industry. To protect confidentiality it is common for the companies to undertake this type of benchmarking through associations of third parties.
 2. **Strategic Benchmarking:** It involves a systematic process by which a company seeks to improve its overall performance by examining the long-term strategies. It involves comparing high-level aspects such as developing new products and services, core competencies etc. It is similar to process benchmarking in nature but differs in its scope and depth.
 3. **Global benchmarking:** It is a benchmarking through which distinction in international culture, business processes and trade practices across companies are bridged and their ramification for business process improvement are understood and utilized. Globalisation and advances in information technology leads to use of this type of benchmarking.
 4. **Process benchmarking:** It involves the comparison of an organisation's critical business processes and operations against best practice organization that performs similar work or deliver similar services.
 5. **Functional benchmarking:** This is used when organizations look to benchmark with partners drawn from different business sectors or areas of activity to find ways of improving similar functions or work processes. This sort of benchmarking can lead to innovation and dramatic improvements.
 6. **Internal Benchmarking:** It involves seeking partners from within the same organization, for example from business units located in different areas. The main advantages are (a) Easy access to sensitive data and information (b) Availability of standardized data; and (c) Lesser requirement of time and resources. However, real innovation may be lacking.
 7. **External Benchmarking:** It involves seeking help of outside organization that are known to be best in class. It provides opportunities of learning from those who are at leading edge. However, this type of benchmarking may take up more time and resource to ensure the comparability of data and information. The credibility of the findings and the development of sound recommendation.
- a) **Intra-Group Benchmarking:** Here the groups of companies in the same industry agree that similar units within the cooperating companies will pool data on their process. The processes are benchmarked against each other at or near operation level. 'Improvement Task forces' are established to identify and transfer best practice to all members of the group.
 - b) **Inter-industry benchmarking:** In Inter-industry benchmarking a non-competing business with similar process is identified and asked to participate in a benchmarking exercise. For example, a publisher of schoolbook may approach a publisher of university level books to establish benchmarking relationship.

Stages in the process of Benchmarking

Stage 1: Planning

- a) **Determination of benchmarking goal statement:** This requires identification of areas to be benchmarked, which uses the following criteria:

Benchmark for Customer Satisfaction	Benchmark for improving Bottom line
• Consistency of product or service • Process Cycle time. • Delivery Performance • Responsiveness to Customers Requirement. • Adaptability to Special Needs.	• Waste and Reject levels • Inventory levels • Work in progress • Cost of Sales • Sales per employee

- b) **Identification of best performance:** The next step is seeking the best. To arrive at the best is both expensive and time consuming, so it is better to identify a company, which has recorded performance success in a similar area.

- c) **Establishment of the benchmarking or process improvement team:** This should include persons who are most knowledgeable about the internal operations and will be directly affected by changes due to benchmarking.
- d) **Defining the relevant benchmarking measures:** Relevant measures will not include the measures used by the organization today but they will be refined into measures that comprehend the true performance differences. Developing good measurement is key to successful benchmarking.

Stage 2: Collection of data and information: This involves the following steps

- Compile information and data on performance. They may include mapping processes.
- Select and contact partners
- Develop a mutual understanding about the procedures to be followed and, if necessary, Benchmarking Protocol with partners.
- Prepare questions
- Distribute schedule of questions to each partner
- Undertake information and data collection by chosen method for example, interview, site- visits, telephone, fax and e-mail.
- Collect the findings to enable analysis.

Stage 3: Analysis of findings:

- Review the findings and produce tables, Charts and graphs to support the analysis
- Identify gaps in performance between our organization and better performers.
- Seek explanations for the gaps in performance. The performance gaps can be positive negative or zero.
- Ensure that comparisons are meaningful and credible. Communicate the findings to those who are affected.
- Identify realistic opportunities for improvements. The negative performance gap indicates an undesirable competitive position and provides a basis for performance improvement. If there is no gap it may indicate a natural position relative to the performance being benchmarked. The zero position should be analysed for identifying means to transform its performance to a level of superiority or positive gap.

Stage 4: Recommendations:

1. **Making recommendations:**

- Deciding the feasibility of making the improvements in the light of the conditions that apply within own organization.
- Agreement on the improvements that are likely to be feasible
- Producing a report on the Benchmarking in which the recommendations are included.
- Obtaining the support of key stakeholder groups for making the changes needed. Developing action plans for implementation.

2. **Implementing recommendations:**

- Implement the action plans
- Monitor performance
- Reward and communicate successes
- Keep key stakeholders informed of progress.

Stage 5: Monitoring and reviewing: This involves:

- a) Evaluating the benchmarking process undertaken and the results of the improvement against objectives and success criteria plus overall efficiency and effectiveness.
- b) Documenting the lessons learnt and make them available to others
- c) Periodically re-considering the benchmarks for continuous improvement.

Pre-requisites for successful benchmarking

1. **Commitment:** Senior managers should support benchmarking and must be committed to continuous improvements.
2. **Clarity of Objectives:** The objectives should be clearly defined at the preliminary stage. Benchmarking teams have a clear picture of their organisation's performance before approaching others for comparisons.
3. **Appropriate Scope:** The scope of the work should be appropriate in the light of the objectives resources, time available and the experience level of those involved.
4. **Resources:** Sufficient resources must be available to complete projects within the required time scale.
5. **Skills:** Benchmarking teams should have the right skills and competencies.

6. **Communication:** Stakeholder, particularly staff and their representatives are to be kept informed of the reasons for benchmarking.

Difficulties in implementation of Benchmarking

1. **Time consuming:** Benchmarking is time consuming and at times difficult. It has significant requirement of staff time and company resources. Companies often waste time in benchmarking non-critical functions.
2. **Lack of Management Support:** Benchmarking implementation require the direct involvement of the senior manager etc. The drive to be best in the industry or world cannot be delegated.
3. **Resistance from employees:** It is likely that there may be resistance from employees.
4. **Paper Goals:** Companies can become preoccupied with the measure. The goal becomes not to improve process but to match the best practices at any cost.
5. **Copy-paste attitude:** The key element in benchmarking is the adaptation of a best practice to tailor it to a company's needs and culture. Without that step, a company merely adopts another company's process. This approach condemns benchmarking to fail.

Benchmarking Code of Conduct:

To contribute to efficient, effective, and ethical benchmarking, individuals agree for themselves and their organization to abide by the following principles for benchmarking with other organizations.

1. **Principle of Legality:** Avoid discussion or actions that might lead to or imply an interest in restraint of trade; market or customer allocation schemes, price fixing dealing arrangements bid rigging, bribery or misappropriation. Do not discuss costs with competitors if costs are an element of pricing.
2. **Principles of Exchange:** Be willing to provide the same level of information that you request in any benchmarking exchange.
3. **Principle of Confidentiality:** Treat benchmarking interchange as something confidential to the individuals and organizations involved. Information obtained must not be communicated outside the partnering organization without prior consent of participating benchmarking partners. An organization's participation in a study should not be communicated externally without their permission.
4. **Principle of Use:** Use information obtained through benchmarking partnering only for the purpose of improvement of operations with the partnering companies themselves. External use or communications of a benchmarking partner's name with their data of observed practices requires permission of that partner. Do not, as a consultant of client, extend one company's benchmarking study findings to another without the first company's permission.
5. **Principle of first part Contact:** Initiate contacts, whenever possible, through a benchmarking contact designated by the partner company. Obtain mutual agreement with the contact on any hand off of communication or responsibility to other parties.
6. **Principle of Third Party Contact:** Obtain an individual's permission before providing their name in response to a contact request.
7. **Principle of Preparation:** Demonstrate commitment to the efficiency and effectiveness benchmarking process with adequate preparation at each process particularly, at initial partnering contact.

Question 39: What are benchmarking code of conduct?

(3 Marks) Nov./04

Question 40: "Balanced score card and performance measurement system endeavours to create a blend of strategic measures, outcomes and drive measures and internal and external measures". Discuss the statement and explain the major components of a balanced score card.

(4 Marks) May/05

Ans.: The balanced score card translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for implementing its strategy. The balanced score card does not focus solely on achieving financial objectives. It is an approach, which provides information to management to assist in strategic policy formulation and achievement. It emphasizes the need to provide the user with a set of information, which addresses all relevant areas of performance in an objective and unbiased manner. As a management tool it helps companies to assess overall performance, improve operational processes and enables management to develop better plans for improvements.

Major components of a balanced scorecard - The components of balanced score cards varies from business to business. A well designed balanced scorecard combines financial measures of past performance with measures of firm's drivers of future performance. The specific objectives and measures of an organization-balanced scorecard can be derived from the firm's vision and strategy. Generally,

balanced score card has the following four perspectives from which a company's activity can be evaluated.

1. Financial perspective: Financial perspective measures the results that the organization delivers to its stakeholders. The measures are: operating income, revenue growth, revenues from new products, gross margin percentage, cost reduction in key areas, economic value added, return on investment.
2. Customer perspective: The customer perspective considers the business through the eyes of customers, measuring and rejecting upon customer satisfaction.
The measures are: - market share. customer satisfaction, customer retention percentage, time taken to fulfil customer's requests.
3. Internal business perspective: The internal perspective focuses attention on the performance of the key internal processes, which drive the business such as innovative process, operation process and post-sales services.
4. Learning & growth perspective: The measure are:- employee education & skills levels, employee turnover ratio, information system availability, percentage of employee suggestion implemented etc.

Question 41: What are the elements of a Balanced Score card? Also explain how it can be used as a Financial Planning model. (4 Marks) May/06

Question 42: Explain briefly the major components of a balanced score card. (4 Marks) May/07

Question 43: "In many organisations, initiatives to introduce balanced score card failed because efforts were made to negotiate targets rather than to build consensus."

Required:

Elucidate the above statement.

(8 Marks) Nov./07

Ans.: Balanced scorecard is a set of financial and non-financial measures relating to a company's critical success factors. It is an approach which provides information to management to assist in strategy implementation. Therefore, the components to be included in the balanced score card must flow from strategy. The targets should be measurable and must flow from strategy and corporate plan of the company. It is necessary that managers should agree to the components and targets because in absence of a consensus, managers may not commit to the targets established by the top management / the board of directors. Moreover, the functions are interdependent and results in one functional area/perspective (e.g. innovation and learning) have direct bearing on the results in other functional area / perspective (e.g. customer perspective). Therefore, it is not sufficient that individual managers agree to their targets. Successful implementation requires that the top management builds an overall consensus on the components and targets of the balanced score card. Negotiation undermines the fundamental principle that the components and targets should flow from strategy. As a result, an approach to establish targets through negotiation defeats the very purpose of balanced score card.

Question 45: Describe the four types of bench marking of critical success factors. (4 Marks) Nov./08-OC

Question 46 [Balance Scorecard]: Kitchen King company makes a high-end kitchen range hood 'Maharaja'. The company presents the data for the year 2003 and 2004:

	2003	2004
1. Units or maharaja produced and sold	40,000	42,000
2. Selling Price per unit in Rs.	1,000	1,100
3. Total Direct Material (Square feet)	1,20,000	1,23,000
4. Direct material cost per square feet in Rs.	100	110
5. Manufacturing Capacity (in units)	50,000	50,000
6. Total Conversion cost in Rs.	1,00,00,000	1,10,00,000
7. Conversion cost per unit of capacity (6)/(5)	200	220
8. Selling and customer service capacity	300	290
	customer	customer
9. Total selling and customer service cost in Rs.	72,00,000	72,50,000
10. Cost per customer of selling and customer service capacity (9)/(8)	24,000	25,000

Kitchen King produces no defective units, but it reduces direct material used per unit in 2004. Conversion cost in each year depends on production capacity defined in terms of Maharaja units that can be produced. Selling and Customer service cost depends on the number of customers that the selling and service functions are designed to support. Kitchen King has 230 customers in 2003 and 250 customers in 2004. You are required

1. Describe briefly key elements that would include in Kitchen King's Balance Score Card.
2. Calculate the Growth, Price-recovery and productivity component that explain the change in operating income from 2003 to 2004. (18 Marks) Nov/05

Ans.: The change in operating income from 2003 to 2004 is analyzed as follows:

	2003	Growth component	Price recovery	(Amount in 000 Rs.) Cost effect of productivity component	2004
Revenue	40000	2000 (F)	4200 (F)	-----	46200
Cost	29200	600 (A)	2560 (A)	580 (F)	31780
Operating Income	10800	1400(F)	1640 (F)	580 (F)	14420

JUST IN TIME & BACK FLUSHING

Question 47: What is JIT? Explain how it eliminates wastage of resources.

(4 Marks) Nov./03

Or

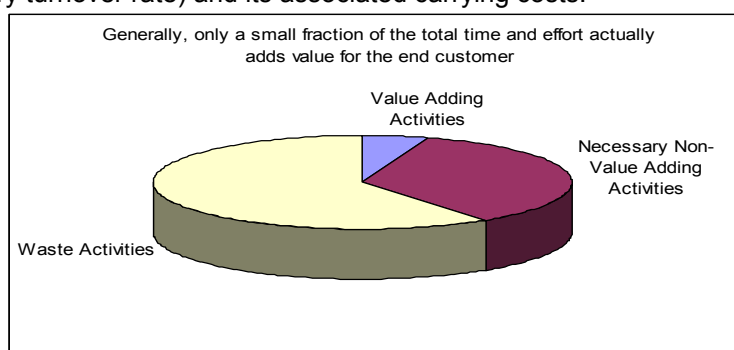
Describe Just-in-time system.

(6 Marks) Nov./08-NC

Ans.: *Just-in-time* (also popularly known as *lean production* or *stockless production*) is can be described as an approach with the objective of producing the right part in the right place at the right time (in other words, "just in time").

JIT is, in its most basic form, the systematic elimination of waste – overproduction, waiting, transportation, inventory, motion, over-processing, defective units – and the implementation of the concepts of continuous flow and customer pull.

The philosophy of JIT is simple - inventory is defined to be waste. It is best described as a philosophy of management, dedicated to the elimination of waste. JIT applies primarily to *repetitive manufacturing* processes in which the same products and components are produced over and over again. An activity that consumes resources but creates no value for the customer. Muda (vulgar Japanese word for "waste") is divided into Muda 1 and Muda 2. Muda 1 is waste that creates no value but is unavoidable with current technologies and policies. An example would be the payroll process. Muda 2 creates no value and can be eliminated. An example would be shop-floor labor reporting. Waste results from any activity that adds cost without adding value, such as the unnecessary moving of materials, the accumulation of excess inventory, or the use of faulty production methods that create products requiring subsequent rework. JIT is an inventory strategy implemented to improve the return on investment of a business by reducing in-process inventory (increasing the inventory turnover rate) and its associated carrying costs.



The basic elements of JIT were developed by Toyota in the 1950's, and became known as the Toyota Production System (TPS). JIT was well-established in many Japanese factories by the early 1970's. JIT began to be adopted in the U.S. in the 1980's (General Electric was an early adopter), and the JIT/lean concepts are now widely accepted and used. Some companies in India which are following the JIT system are HONDA MOTORS, AT & T & SIEMENS.

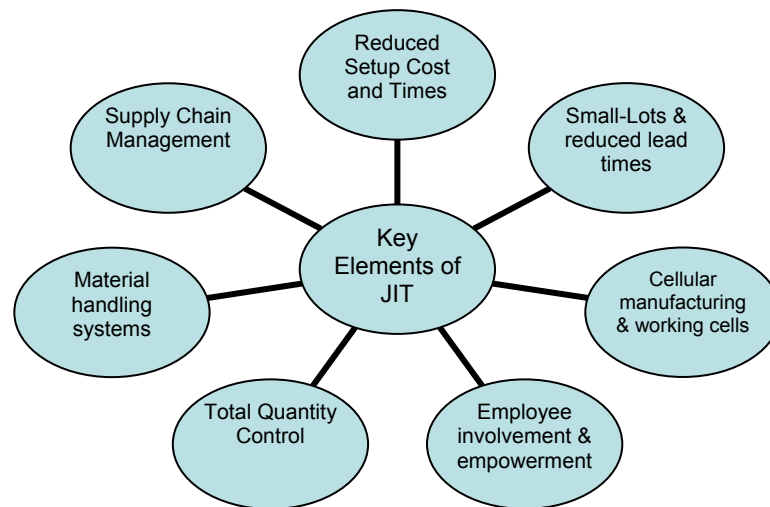
Question 48: What are key elements of JIT? Explain in details.

Ans.: 1. Reduced Setup Cost and Times : from months to hours thus making small-lot production economically viable; achieved by organizing procedures, using carts, and training workers to do their own

setups. Aim for single digit setup times (less than 10 minutes) or "one-touch" setup -- this can be done through better planning, process redesign, and product redesign. A good example of the potential for improved setup times can be found in auto racing, where a NASCAR pit crew can change all four tires and put gas in the tank in under 20 seconds. The pit crew's efficiency is the result of a team effort using specialized equipment and a coordinated, well-rehearsed process. Similarly in industries for semi-versatile machinery such as big stamping presses

2. Small-Lot production & reduced lead times^A : reducing setup times allows economical production of smaller lots; close cooperation with suppliers is necessary to achieve reductions in order lot sizes for purchased items, since this will require more frequent deliveries; lead times can be reduced through close cooperation with suppliers, possibly by inducing suppliers to locate closer to the factory. Control systems such as a **kanban** (card) system (or other signaling system) should be used to convey parts between work stations in small quantities (ideally, one unit at a time).

[^ALead Time is the amount of time between placing of an order & the receipt of the goods ordered.]



3. Cellular manufacturing & working cells³ : production lead times can be reduced by moving work stations closer, together applying group technology and cellular manufacturing² concepts, reducing queue length (reducing the number of jobs waiting to be processed at a given machine), and improving the coordination and cooperation between successive processes. The general idea is that the machines needed to carry out the manufacture of a particular product family¹ are arranged in the form of discrete 'mini' assembly line. The machines are grouped together in a sequential order required by processing so that there is an even, constant and balanced flow of materials throughout the entire production process without queuing by machines or returning to stores.

E.g., Traditional manufacturing operations are organized by functional specialty into plant departments that all presses are in one department, all milling machines in another, welding machines in another and so forth. Workers are spread out along linear shaped production lines and inevitably produce goods in large batches or lots. Batch oriented linear production means that an operation completes all of the shop order and then moves it to the next operation for further processing. In a JIT cellular organization, just the opposite is the norm. Production is organized by product rather than by function with equipment dedicated or partially dedicated to a family of products. Production in such "cells" is conducted sequentially in the order in which operations must be performed to produce the end item. Workers in this type of environment are in close proximity to one another and are performing operations on lots of one.

[1. Product family: Products with similar production requirements.

2. Cellular manufacturing: The layout of machines of different types performing different operations in a tight sequence, typically in a U-shape, to permit single-piece flow and flexible deployment of human effort by means of multi-machine working.

3. Working cell: A small cluster of machines, which can be run by a single machine operator.]

4. Employee involvement and empowerment: workers should be trained to operate several machines, to do several specialized tasks, to perform minor maintenance tasks, for house keeping and to perform quality inspections. Use machine and worker idle time to maintain equipment and prevent breakdowns. In general, JIT requires teams of competent, empowered employees who have more responsibility for their own work.

5. Implement a zero defects quality program : A *quality at the source* program must be implemented to give workers the personal responsibility for the quality of the work they do, the authority to stop production when something goes wrong & if possible to immediately fix it & If the defect cannot be readily fixed to halt the entire line by pulling a cord (called *jidoka*).

6. Stabilize and level the Master Production Schedule (MPS)⁴ with uniform plant loading: create a uniform load on all work centers through constant daily production (establish **freeze windows** to prevent changes in the production plan/schedule for some period of time) and mixed model assembly (produce roughly the same mix of products each day, using a repeating sequence if several products are produced on the same line). Meet demand fluctuations through end-item inventory rather than through fluctuations in production level. Use of a stable production schedule also permits the use of **backflushing** to manage inventory: an end item's bill of materials is periodically exploded to calculate the usage quantities of the various components that were used to make the item, eliminating the need to collect detailed usage information on the shop floor.

[4. Master Production Schedule: It specifies the quantity of each finished unit of products to be produced, and the time at which each unit will be required.]

7. Supplier involvement, supplier quality assurance and: the manufacturer should treat its supplier as a long-term partners; they often must be trained in ways to reduce setup times, inventories, defects, machine breakdowns, etc. in order to enable them to take responsibility for delivering the best possible parts/services to the manufacturer in a timely manner. Errors leading to defective items must be eliminated, since there are no buffers of excess parts.

Question 49: What do you mean by Kanban Production Control System & how does it differ from traditional systems? Give appropriate examples.

Ans.: A kanban or "pull" production control system uses simple, visual signals to control the movement of materials between work centers as well as the production of new materials to replenish those sent downstream to the next work center. As implemented in the Toyota Production System, a **kanban** is a card that is attached to a storage and transport container. It identifies the part number and container capacity, along with other information, and is used to provide an easily understood, visual signal that a specific activity is required.

Egs. of Pull system:

1. Imagine a supermarket, where there are cards attached to all items on shelves. At the checkout, the cashier takes the cards off the items and sends them to the warehouse, who send replacement items. The warehouse also uses the same system, and when a carton is picked off the shelves, the card attached to it is sent further back upstream.

2. Kanban system implementation might be a "three-bin system" for the supplied parts (where there is no in-house manufacturing) — one bin on the factory floor, one bin in the factory store and one bin at the suppliers' store. The bins usually have a removable card that contains the product details and other relevant information — the kanban card. When the bin on the shop floor is empty, the bin and kanban card are returned to the store. The store then replaces the bin on the factory floor with a full bin, which also contains a kanban card. The store then contacts the supplier and returns the now empty bin with its kanban card. The suppliers inbound product bin with its kanban card is then delivered into the factory store completing the final step to the system. Thus the process will never run out of product and could be described as a loop, providing the exact amount required, with only one spare so there will never be an issue of over-supply. This 'spare' bin allows for the use, transport and uncertainty in supply that are inherent in the system.

Eg. Of Push System:

Consider the alternative. Every Friday, the warehouse sends three cartons of frozen peas to each supermarket. The number of cartons delivered is based on a calculation, done at some time in the past, on average usage. This means that some supermarkets will run out, whilst others will have peas coming out of their ears! This is a push system.

Many manufacturers have implemented electronic kanban systems. Electronic kanban systems, or E-Kanban systems, help to eliminate common problems such as manual entry errors and lost cards. E-Kanban systems can be integrated into enterprise resource planning (ERP) systems.

In some pull systems, other signaling approaches are used in place of kanban cards. For example, an empty container alone (with appropriate identification on the container) could serve as a signal for replenishment. Similarly, a labeled, pallet-sized square painted on the shop floor, if uncovered and visible, could indicate the

need to go get another pallet of materials from its point of production and move it on top of the empty square at its point of use.

A kanban system is referred to as a **pull-system**, because the kanban is used to pull parts to the next production stage only when they are needed. In contrast, an MRP⁵ system (or any schedule-based system) is a **push system**, in which a detailed production schedule for each part is used to push parts to the next production stage when scheduled. Thus, in a pull system, material movement occurs only when the work station needing more material asks for it to be sent, while in a push system the station producing the material initiates its movement to the receiving station, assuming that it is needed because it was scheduled for production. The weakness of a push system (MRP) is that customer demand must be forecast and production lead times must be estimated. Bad guesses (forecasts or estimates) result in excess inventory and the longer the lead time, the more room for error. The weakness of a pull system (kanban) is that following the JIT production philosophy is essential, especially concerning the elements of short setup times and small lot sizes, because each station in the process must be able to respond quickly to requests for more materials.

[5. Material Requirements Planning (MRP) is software based production planning and inventory control system used to manage manufacturing processes.]

Question 50: How does the JIT approach help in improving an organization's profitability? (4Marks) May/07
OR

Explain, how the implementation of JIT approach to manufacturing can be a major source of competitive advantage. (4 Marks) Nov./08-OC

Ans.: JIT approach helps in the reduction of costs/increase in prices as follows:

- (i) **Least scrapping** - Immediate detection of defective goods being manufactured so that early correction is ensured with least scrapping.
- (ii) **Reduced WIP costs** - Eliminates/reduces WIP between machines within working cell.
- (iii) **Reduced Overhead Costs** - Overhead costs from non-value added activities in the form of rentals for inventory, insurance, maintenance costs etc. are reduced.
- (iv) **Higher Selling Price** - Higher product quality ensured by the JIT approach leads to higher premium in the selling price.
- (v) **Early Detection** - Detection of problem areas due to better production/scrap reporting/labour tracing and inventory accuracy lead to reduction in costs by improvement.

Question 51: Explain in brief the JIT approach for reducing WIP inventory.
OR

Difference in operating speeds of machines may lead to higher WIP inventory. How does JIT system resolve this issue?

Ans.: JIT approach for reducing WIP inventory:

At times, there may be huge differences between the operating speeds of different machines, e.g. Process 1 of machinery may produce 180 components per hour whereas Process II machine may finish only 135 units per hour. This affects cost in following manner:

- **Piling up of WIP inventory:** Work-in-process inventory builds up in front of the slowest machines.
- **Delayed tracing of Defectives:** Defective parts produced by an upstream machine may not be discovered until the next downstream machine operator finds them later. By that time, the upstream machine may have created more defective parts, all of which must now be destroyed or reworked.

In JIT philosophy, there are two ways to resolve the above problems.

1. **Kanban Card:** Explained in detail in Question 3
2. **Working Cells:** Explained in detail in Question 2 Point 3

Question 52: What are the advantages of working cells in JIT environment?

Ans.: The establishment of working cells has the following advantages:

- The individual machine operator takes each output part from machine to machine within the cell; and thus there is no way for WIP to build up between machines.
- The operator can immediately identify defective output which otherwise is difficult for each machine of the cell. The smaller machines used in a machine cell are generally much simpler than the large automated machinery they replace. Hence maintenance costs are reduced.
- It is much easier to reconfigure the production facility when it is necessary to produce different products, avoiding the large expense of carefully repositioning and aligning equipment.

Question 53: How does JIT help in shortening set-up and operation times?

OR

Outline the JIT approach for shortening set-up and operation times.

Ans.: Long set-ups and operation time involve indirect costs like product obsolescence, inventory carrying costs, and many defective products (because problems may not be discovered until a large number of items have already been completed). This problem will be resolved under JIT by adopting the following steps.

1. Test data: A videotape of a typical set is prepared for analysis purposes.

2. Evaluation: A team of industrial engineers and machine users examine this tape, spotting and gradually eliminating steps that contribute to a lengthy set-up.

3. Motion and time study: By eliminating unnecessary production steps and improving others after a number of iterations, it is possible to achieve substantially lower set-up times than before.

4. Effects: Reduction in set-up time has the following effects: Reduction in the amount of work-in-process, Reduction in the number of products that can be produced before, defects are identified and fixed, thereby reducing scrap costs.

Question 54: List a few benefits associated with JIT system.

Ans.: Benefits associated with JIT system are:

1. Reduction in Inventory levels: Unnecessary piling up of Raw Materials, WIP and finished goods are avoided. The focus is on production and purchase as per the firm's requirements.

2. Reduction in Wastage of Time: Wastage of time in various ways like inspection time, machinery set-up time, storage time, queue time, defectives rework time etc., are reduced.

3. Reduction in Scrap Rates: There will be sharp reductions in the rates of defectives or scrapped units. The workers themselves identify defects and take prompt action to avoid their recurrence.

4. Reduction in Overhead Costs: By reducing unnecessary (non value-added) activities and the associated time and cost-drivers, overheads can be greatly reduced e.g. material handling costs, rework costs, facility costs etc.

Question 55: Explain the Impact of JIT on Product Prices.

Ans.: When a company achieves a higher level of product quality, along with ability to deliver products on the dates required, customers may be willing to pay a premium. If customers are highly sensitive to quality or delivery reliability (which are the benefits of JIT), it may be possible to increase price substantially.

If customers place a higher degree of importance on other factors, then there will be no opportunity for a price increase. In case all firm in an industry adopt JIT, they offer the same level of quality and service. JIT philosophy, in such cases, just keeps a company from losing sales to its competitors.

The impact of a JIT system on product pricing is primarily driven by customer's perceived need for higher product quality and reliable delivery times, as well as the presence of competitors with JIT system, the same installation, and operational base.

Question 56: Identification of Machine Cells under JIT for systematic Overhead Cost Allocation.

Ans.: a. A working Cell or a machine Cell is a small cluster of machines, which can be run by a single machine operator.

b. It designed to produce either a single product or a single component that goes into a similar product line. Therefore all costs generated by the machine cell can be charged directly to the only product it produces.

c. When a company completely changes over to the use of machine cells in all locations, the cost related to all the cells can now be charged directly to products. The balance costs left may be assigned to the Overhead Cost Pool and identified with the products through Activity Based Costing. This results in more accurate product costs.

Some **examples** of shift from Overheads to Direct Machine Cell Costs are:

a. **Depreciation:** Depreciation of each machine in a machine cell can be charged directly to a product. It may be possible to depreciate a machine based on its actual use, rather than charging off a specific amount per month.

b. **Electricity:** Power used by the machine in a cell can be separately metered and charged directly to the products that pass through the cell. Excess electricity cost charged to the facility as whole has to be charged to an overhead cost pool for allocation.

c. **Material handling:** In a JIT system, most material handling cost are limited since machine operators move parts around within their machine cells. Only costs for materials handling between cells and charged to an overhead cost pool for allocation.

d. **Operating Suppliers:** Supplies are used mostly with the machine cells to the majority of item sin this expense category can be separately tracked by individual cell and charged to products directly.

e. **Repairs and maintenance:** All maintenance costs incurred for machinery can be grouped into machine cells. By having the maintenance staff, charge their time and materials to these cells, these costs can be charged straight to products. Maintenance work on the facility will be charged to an Overhead cost pool.

f. **Supervision:** If supervision is by machine cell, the cost of the supervisor can be split among the cells supervised. However the cost of general facility management as well as of any support staff, must still be charged to an overhead cost pool.

With such a higher proportion of direct costs associated with each product managers have much more relevant information about the true cost of each product manufactured.

Question 57: What do you mean by 'Back flushing' in JIT system? Explain briefly the problems with back flushing that must be corrected before it will work properly. (4 Marks) Nov./04 & (5 Marks) June/09-OC

Ans.: Backflush accounting is a product costing approach, used in a Just-In-Time (JIT) operating environment, in which costing is delayed until goods are finished. Standard costs are then flushed backward through the system to assign costs to products. The result is that detailed tracking of costs is eliminated. Journal entries to inventory accounts may be delayed until the time of product completion or even the time of sale, and standard costs are used to assign costs to units when journal entries are made, that is, to flush costs backward to the points at which inventories remain. On completion of finished goods, its quantity is multiplied by components required per item produced (as per bills of material). Resultant value is subtracted from beginning inventory; balance inventory is closing stock/inventory. The principle of backflushing is that whenever one part is made, the stock of the components on the part's bill of material (BOM)⁸ can be reduced by the quantity on the bill of material. If, for instance, the stock of car batteries is held beside the car assembly line, the stock of car batteries can be reduced by one every time a car is made (typically the component stock is reduced when the work order is booked into stock). It can be argued that backflush accounting simplifies costing since it ignores both labour variances and work-in-progress.

The problems of back flushing that must be corrected before it will work properly are:

1. Accurate BOM - Bill of material accuracy must be maintained at 100% including scrap factors.
2. Proper changes in BOM - Any changes to bills of material must be timed to match the backflush of the changed process.
3. Inventory accuracy - Stock checking is more difficult as computer record must be checked with stock on the shelf plus all materials and ingredients that have been issued but not yet backflushed.
4. Scrap reporting - All scrap and re-work must be reported as soon as it happens.
5. Production reporting - Every single jobs requiring any stocked materials must have a work order opened and backflushed.
6. Lot Tracing - Lot tracing is impossible under the back flushing system. This is required when a manufacturer needs to keep records of which production lots were used to create a product in case all the items in a lot need to be recalled. Only a picking system (issue material from stores on a pick list based on a works order system) can adequately record this information. Some computer systems allow picking and backflushing system to coexist.

[8. BOM File specifies sub-assemblies components and materials required for each finished good.]

Question 58: Discuss the treatment of material, labour, overheads, & WIP in back flush accounting.

Ans.: Traditional & Standard costing systems use sequential tracking costing system for accounting costs. It has trigger points⁷, corresponding to journal entries as transaction occur i.e. purchase, issue of material, production, overhead absorption, completion of finished goods, etc.

An alternative approach to sequential tracking is backflush costing. Backflush accounting system simplifies the accounting records by avoiding the need to follow the movement of materials and work-in-progress through the manufacturing process within the organization.

There are several variants of backflush accounting, one of them is that in spite of separate raw materials and WIP A/c there is single **Raw and in-Process A/c (RIP)**. The use of standard costs and variances is likely to be incorporated into the accounting entries. Transfers from raw and in-progress account to finished goods (or cost of sales) will probably be made at standard cost. The difference between the actual inputs and the standard charges from the raw and in-progress account will be recorded as a residual variance which will be recorded in the profit and loss account. Thus, it is essential that standard costs are a good surrogate for actual costs if large variances are to be avoided.

Conversion costs are recorded as incurred in backflush accounting system. All indirect expenses (**Direct Labour is treated as indirect cost**) are treated as period costs in it. Direct Labour and overhead are

combined into temporary A/c i.e. Conversion cost control A/c. This A/c accumulates the actual conversion cost on debit side and applied conversion cost on the credit side.

Naturally, management will still be eager to ascertain the cause of any variances which arise from the inefficient usage of materials, labour, and overheads. However, investigations are far more likely to be undertaken using non-financial performance indicators as opposed to detailed cost variances.

Backflush accounting is ideally suited to a just-in-time philosophy and is employed where the overall cycle time is relatively short and inventory levels are low.

[7. Trigger point = point at which entries are made in A/cing system. It may be receipt of materials or completion/sale of goods. If system is full JIT, completion is trigger point.]

Question 59 [JIT]: The Evans Corporation manufactures wireless telephone. Evans is deciding whether to implement a JIT production system. Which would require annual tooling costs of Rs.150000. Evans estimated that the following annual benefits would arise from JIT production.

- Average inventory would decline by Rs. 700000. from Rs. 900000 to Rs.200000.
- Insurance space materials – handling , and setup costs, which currently total Rs.200000,would decline by 30%.
- The emphasis on quality inherent in JIT system would reduce rework costs by 20%. Evans currently incurs Rs.3,50,000 on rework.
- Better quality would enable Evans to raise the selling prices of its products by Rs. 3 per unit Evans sells 30,000 units each year.

Evans's required rate to return on inventory investment is 12% pr year.

Required;

Calculate the net benefit or cost to the Evans Corporation from implementing a JIT production system. Suppose Evans implements JIT productions. (a) Give examples of performance measures Evans could use to evaluate and control JIT production. (b) What is the benefits to Evans of implementing an enterprise resource planning (ERP) system?

[Ans.: Annual Relevant Costs of Current Production System and JIT Production System for Evans Corporation.

<u>Relevant Items</u>	<u>Relevant Costs under Current Production System</u>	<u>Relevant Costs under JIT Production System</u>
Total net incremental costs	Rs.6,58,000	Rs.5,04,000
Annual difference in favor of JIT production	↑ Rs.1,54,000 ↑	

Question 60 [JIT]: X Video Company sells package of blank video tapes to its customer. It purchases video tapes from Y Tape Company @ Rs140 a packet. Y Tape Company pays all freight to X Video Company. No incoming inspection is necessary because Y Tape Company has a superb reputation for delivery of quality merchandise. Annual demand of X Video Company is 13,000 packages. X Video Co. requires 15% annual return on investment. The purchase order lead time is two weeks. The purchase order is passed through Internet and it costs Rs2 per order. The relevant insurance, material handling etc Rs 3.10 per package per year. X Video Company has to decide whether or not to shift to JIT purchasing. Y Tape Company agrees to deliver 100 packages of video tapes 130 times per year (5 times every two weeks) instead of existing delivery system of 1,000 packages 13 times a year with additional amount of Rs0.02 per package. X Video Co. incurs no stock out under its current purchasing policy. It is estimated X Video Co. incurs stock out cost on 50 video tape packages under a JIT purchasing policy. In the event of a stock out, X Video Co. has to rush order tape packages which costs Rs4 per package. Comment whether X Video Company should implement JIT purchasing system.

Z Co. also supplies video tapes. It agrees to supply @ Rs13.60 per package under JIT delivery system. If video tape purchased from Z Co., relevant carrying cost would be Rs3 per package against Rs3.10 in case of purchasing from Y Tape Co. However Z Co. doesn't enjoy so sterling a reputation for quality. X Video Co. anticipates following negative aspects of purchasing tapes from Z Co.

- To incur additional inspection cost of 5 paise per package.
- Average stock out of 360 tapes packages per year would occur, largely resulting form late deliveries. Z Co. cannot rush order at short notice. X Video Co. anticipates lost contribution margin per package of Rs8 from stock out.

- Customer would likely return 2% of all packages due to poor quality of the tape and to handle this return an additional cost of Rs25 per package.

- Comment whether X Video Co places order to Z Co.

(12 Marks) Nov/05

[Ans.: (i)]

Particulars	Current Policy Rs	JIT Rs
Total relevant cost	18,32,076	18,21,925.15

Comments: Hence, a JIT purchasing policy should be adopted by the company.

Comments : The comparative costs are as follows,

Under current policy Rs 18,32,076.00

Under purchase under JIT Rs 18,21,925.10

Under purchase from Z Co Ltd Rs 1,87,342.00

Packages should be bought from Z Co as it is the cheapest.]

VALUE CHAIN ANALYSIS

Competitive advantage for a company means not just matching or surpassing their competitors, but discovering what the customers want and then profitably satisfying and even exceeding their expectations. As barriers to global trade are diminishing, customers can acquire the best of what they want, at an acceptable price, from anywhere in the world.

A strategic tool to measure the importance of the customer's perceived value is value chain analysis.

Classification of business activities for VCA purpose:

Porter classified business activities into (a) Primary or Line activities and (b) Support activities

- a) **Primary activities** are directly involved in transforming inputs into outputs and delivery and after sales support to output. They are handled by line functions in an organisation. They include:
 - Material handling and warehousing
 - Transforming inputs into final product
 - Order processing and distribution Communication, pricing and channel management, and
 - Installation, Repair and parts replacement
- b) **Support activities** are activities that support primary activities. They are handled by the organisation's staff functions and include:
 1. **Procurement** – purchasing of raw materials, supplies and other consumable items as well as assets.
 2. **Technology Development** – know-how, procedures and technological inputs needed in every value chain activity.
 3. **Human resource management** – Selection, promotion and placement, appraisal, rewards; management development and labour / employee relations.
 4. **Firm Infrastructure** – general management, planning, finance, accounting, legal government affairs and quality management.

Industry Value Chain.

Industry Value Chain refers to the series of activities, which add value to the product supplied to the industry. It starts with the value-creating processes of suppliers, who provide the basic raw materials and components. It continues with the value creating processes of different classes of buyers or end-use consumers and culminates in the disposal and recycling of materials.

Firm's competitive advantage

1. To survive and prosper in an industry, a firm must meet two criteria
 - Supply what customers want to buy, and
 - Survive competition
2. A firm's overall Competitive Advantage is derived from the difference between Value Offered to Customers and Cost of creating that customer value.
3. This Competitive advantage takes two possible forms
 - Differentiation Advantage and
 - Low-Cost Advantage.

A comparative analysis of these forms is given below:

Differentiation Advantage	Low - Cost Advantage
It occurs when customers perceive that a firm's product offering is of higher quality, involves less risk and/or outperforms competing products offered by competitors. Customers are thus willing to pay a premium price for this product.	A firm enjoys a relative low-cost advantage if its total costs are lower than the market average.
Gained by: • Ability to deliver goods & services in timely manner • Producing better quality • Provision of after-sales support services • Offering a wider range of goods and services etc.	Gained by: • Access to low cost raw material • Innovative process technology • Access to distribution channels • Economies of scale • Superior operating management etc.
Advantage can be exploited by: • Increasing prices to offsets the improvement in customer benefits thus maintaining current market share; or • Pricing below the 'full-premium' level in order to build market share.	Advantage can be exploited by: • Pricing the products lower than it's competitor's so as to gain market share and maintain current profitability or, • Matching with the price of competing products and increase its profitability
Superior relative differentiation position offers the customers better value for an equivalent price.	Superior relative cost position offers customers equivalent value for a lower price.

Use of VCA to assess competitive advantage

A company can gain competitive advantage not just by matching or surpassing its competitors, but discovering what the customers want and then profitably satisfying and even exceeding, customer expectations. This is done by a concept called Value Chain analysis (VCA).

VCA can be used to better understand which segment, distribution channels, price points, product differentiation, selling propositions and value chain configurations will yield the firms the greatest competitive advantage.

Use of VCA to assess competitive advantage involves the following analyses:

1. **Internal Cost analysis** – to determine the sources of differentiation (including the cost) within internal value-creating processes
2. **Internal Differentiation analysis** – to under the sources of differentiation (including the cost) within internal value-creating processes; and
3. **Vertical Linkage analysis** – to understand the relationships and associated costs among external suppliers and customers in order to maximize the value delivered to customers and to minimize cost.

The following actions and steps are involved in the above analyses:

Stage	Description
1.	Internal Cost Analysis: • Identify the firm's value creating processes • Determine the portion of the total cost of the product or services attributable to each value-creating process. • Identify the cost drivers for each process. • Identify the links between processes • Evaluate the opportunities for achieving relative cost advantage.

2.	Internal Differentiation Analysis: - Identify the industry's value creating processes - Evaluate differentiation strategies for enhancing customer value - Determine the best sustainable differentiation strategies
3.	Vertical Linkage Analysis - Identify the industry's value chain and assign costs, revenues and assets to value-creating processes. - Diagnose the cost drivers for each value-creating process; and - Evaluate the opportunities for sustainable competitive advantage

Features of this analysis:

1. **Not mutually exclusive** – Firms begin by focusing on their internal operations and gradually widening their focus to consider their competitive position within their industry.
2. **Continuous** – VCA is a continuous process of gaining competitive advantage not a one- time affair.
3. **Part of Strategic Planning:** VCA is a process of gathering, evaluating and communicating information for business decision-making.

Steps involved in Internal Cost Analysis (Stage 1)

1. **Identify the firm's value-creating processes**
 - Traditionally, the firm organizes itself into departments based on cost, revenue profit and investment centers. These centers are useful for control but are not very useful for identifying value-creating processes.
 - Adopting a process perspective requires a horizontal view of the organization beginning with product inputs and ending with outputs and customers.
 - Processes are structured and measured sets of activities designed to produce a specified output for a particular customer or market.
 - Emphasising process means focusing not on what work is done but on how work is done within the organization.
 - Process Structure differs from traditional hierarchical structure and shows how the organization delivers customer value. While it is not possible to measure or improve hierarchical structure in any absolute sense, processes lend themselves to such measures as cost, time, output quality and customer satisfaction.
2. **Determine the portion of total cost of the product/service attributable to each value creating process:**
 - A full-cost approach provides the best estimate of life-cycle costs for evaluating the strategic cost advantage of a firm's value-creating process.
 - For estimating the full cost of each value-creating activity, full utilization of the capacity of the activity or its practical capacity is normally used. Facility managers and equipment vendors are useful sources of capacity estimates. When cost vary dramatically, companies should seek more information for a more realistic long-term estimate of capacity.
3. **Identify the cost drivers for each process**
 - By listing cost drivers, a firm can assign priorities among its cost improvement initiatives.
 - In order to determine its relative cost advantage, a firm should also know the cost factors of its competitors.
 - Multiple cost drivers are identified for each value-creating process. These may be classified into (a) Structural cost drivers (covering aspects such as Scale, Scope, learning, Technology and Complexity etc.) and (b) Executional Cost Drivers (Capacity utilization, plant layout, Product design, Employee participation, Supplier and customer liaison, etc.)

Structural Cost Drivers	Executional Cost Drivers
- They consist of organizational factors that determine the economic structure driving the cost of firm's product. - These cost drivers reflect a firm's long-term firm in its decisions, which position the industry and marketplace.	- They capture a firm's operational decisions on how and best to employ its resources to achieve its goals objectives. - These cost drivers are determined by management policy, style and culture. They are comparatively short term.

• Structural cost drivers may change. • Example: Large Pharmaceutical Companies Economies of scale that lower their unit enjoy costs for expensive R&D.	• Executorial cost drivers may improve. • Example:-Worker empowerment and flattened continuous organization help many firms in their improvement efforts.
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4. Identify the links between processes

- Activities within a value chain are interdependent and hence firms must identify value chain linkages among interdependent activities that may impact their total cost.
- Cost improvement programs in one value chain process may lower or increase costs and/or revenues in other processes. Transfer of goods and services from one value
- Chain process to another increases cost. Eliminating these transfer or costs has an impact on overall costs in the subsequent chain.
- Such linkage offer sustainable competitive advantage, because of their subtle, complex and inimitable nature.

5. Evaluate the opportunities for achieving relative cost advantage

- Using the value chain approach, a company goes beyond simple across-the-board cuts and attempts to lower cost and improve efficiency within each value-creating process. For instance a company might negotiate lower costs of process inputs such as wages or purchases, or evaluate make-or-buy options.
- Reducing process input costs may consist of measures such as negotiating lower wages, moving production to countries cheaper labour costs, entering into long term contracts with suppliers at reduced prices, etc. Companies also buyer-seller partnerships to gain advantages in cost quality, flexibility, delivery and, technology.
- Using Pareto Analysis company should prioritize its value-creating processes since 20% of value creating processes often account for 80% of total costs.

Steps in Internal Differentiation Analysis (Stage 2)

i. Identify the customers' value-creating processes:

To pursue a superior differentiation strategy, a firm's processes must enhance the value of its customers. Therefore, a firm should carefully study the value-creating processes of its customers.

ii. Evaluate differentiation strategies for enhancing customer value:

This involves identification of the value-creating processes that distinguishes a firm's products or services from those of its competitors. This can be achieved in the following areas:

- Product Features** - that are aesthetically or functionally superior
- Marketing Channels** – that provide levels of responsiveness, convenience, variety and information.
- Service and Support** – tailored to meet end-user and channel member (sophistication and urgency or need).
- Brand / lineage Positioning** – that lends greater appeal to the company's products on critical selection criteria.
- Price:** including both net purchase price and cost savings available to the customer through the financial services market.

iii. Determine the best sustainable differentiation strategies:

In order to prioritize its processes as sources of differentiation, a company must determine what attributes of each process enhance customer value. The more unique a firm's resources and skills, the more sustainable is its differentiation advantage over competitors.

Steps in Vertical Linkage Analysis (Stage 3)

Vertical linkage analysis is a much broader application of internal cost and differentiation analysis that includes all upstream and downstream value-creating processes throughout the industry. It considers all links from the source of raw materials to the disposal and/or recycling of the product. It involves the following steps:

1. Identify the industry's value chain and assign costs, revenues and assets to value creating processes.

- The firm should identify the vertical linkages in the industry value chain, for example, the petroleum industry consist of numerous value creating processes or activities, including

exploration, production, refining, marketing and distribution, which define the value chain for this industry.

- One firm may participate in all parts of this value chain; another firm may participate in only a few.
 - The information systems to identify and analyse these subtle relationship should be developed
 - Costs, Revenues and Assets of each value-creating process may be determined based on relevant cost approach, use of market prices, transfer prices, current replacement cost of assets, etc.
2. **Diagnose the cost drivers for each value-creating process:**
 - Different cost determinants should be identified for each value-creating process.
 - Direct labour-based measures may be suitable for labour-intensive activities while operating hours may be appropriate for machine based activities.
 3. **Evaluate the opportunities for sustainable competitive advantage:**
 - Sufficient qualitative information usually exists on a firm's major value-creating processes and the strategies for each. Such information will be difficult to obtain and may also be unreliable.
 - Using benchmarking processes and by understanding how other companies compete in each process of the industry value chain, a firm can use the qualitative analysis to seek
 - out competitive niches even if financial data are unavailable.
 - To evaluate the opportunities for competitive advantage in the global marketplace, firms need to consider such things as a country's values, political climate, environmental concerns, trade relations, tax laws, inflation rates and currency fluctuations.

Strategic frameworks required for value chain analysis

Value chain analysis requires a strategic framework of focus for organizing internal and external information, for analyzing information, and for summarizing findings and recommendations.

Recent concepts from strategists and organization experts lead to three strategic frameworks for VCA.

1. Industry structure analysis:
2. Core competencies analysis and
3. Segmentation analysis

1. Industry Structure Analysis of Michael Porter

It is a five-factor model to organise information about an industry structure to evaluate its potential attractiveness. Under this model, the profitability of an industry or market is measured by the long term return on investment of the average firm depends largely on the following five factors that influence profitability.

a) Bargaining power of buyers:

- The degree of buyer power generally depends on:
- Customer concentration (higher concentration of customers means greater negotiation leverage).
- Propensity for customers to integrate backward (higher propensity for backward integration means greater bargaining leverage);
- Costs of switching suppliers (lower switching costs means greater leverage for the buyer) and
- Number of alternative suppliers (higher alternatives indicate greater customer leverage.)

b) Bargaining power of suppliers:

Just as powerful buyers can squeeze profits by putting downward pressure on prices, suppliers squeeze profits by increasing input costs. The same factors that determine the power of buyers also determine the power of suppliers. The bargaining power of suppliers and buyers relative to the firm depends on the relationships between their value chains. Identifying the specific activities involved and the nature of their strengths and relationships can give important insights into the power balance between the buyer and seller, and how it may be altered for, the firm's benefit.

c) Threat of substitute products or services:

- Profit potential is determined by the maximum price that customers are willing to pay, which in turn depends on the availability of substitutes.
- Products with few substitutes command higher prices than products with many close substitutes since customer will prefer switching in the latter case.
- A thorough understanding of the value chains of buyers as they relate to the firm's product can help in assessing (and combating) the threat of substitution.

d) **Threat of new entrants:**

- When an industry is earning a return on invested capital above the cost of capital, that industry will act as a magnet to firms outside the industry.
- Unless the entry of new firms is barred, the rate of profit must fall to the competitive level.
- Even the mere threat of entry may be sufficient to ensure that established firm's constrain their prices to the competitive level.

e) **Intensity of competition:**

- Markets experiencing rapid growth typically see less intense competition
- Rival companies can usually satisfy profitability and growth without having to take market shares from their competitors.

2. **Core Competencies Analysis**

Core competencies are created by superior integration of technological, physical and human resources. They represent distinctive skills as well as intangible, invisible, intellectual assets and cultural capabilities. Cultural capabilities refer to the ability to manage change, the ability to learn and team working. Organisations should be viewed as a bundle of a few core competencies, each supported by several individual skills.

Core competence based diversification reduces risk and investment and increases the opportunities for transferring learning and best practice across business units.

A core competence is identified by the following tests:

- **Leverage test** - Does it provide potential access to a wide variety of markets?
- **Value enhancement test** – Does it make a significant contribution to the customer's perception regarding benefits of the end product?
- **Imitability test** – Can it be imitated? Does it reduce the threat of imitation by competitors?

Applying the VCA approach to core competencies for competitive advantage includes the following steps:

- **Validate core competencies in current businesses:** Core competencies should tie together the portfolio of end products and help the firm excel in dominating its industry. Core competencies need to be continually validated, due to continuous technological development over time.
- **Export or leverage core competencies to the value chains of other existing businesses:** The same set of core competencies can be exploited in multiple businesses by exporting core competencies to the value chains of other existing businesses.
- **Use core competencies to reconfigure the value chains of existing businesses:** While firms may manage their existing value chains better than their competitors, sophisticated firms work harder on using their core competencies to reconfigure the value chain to improve payoffs. Otherwise competitors may, exploit opportunities.
- **Use core competencies to create new value chains:** With strong core competencies in its existing businesses, an organization can seek new customers by developing new value chains.

3. **Segmentation Analysis (Stage 3)**

Industries are sometimes collections of different market segments. Vertically integrated industries are examples of a string of natural businesses from the source of raw material to end use by the final consumer. Not all firms in an industry participate in all segments.

Segmentation analysis will reveal competitive advantages and disadvantages of different segments. A firm may use this information to decide whether to exit the segment, to enter a segment, reconfigure one or more segments, or embark on cost reduction/differentiation programs.

Using the value chain approach for segmentation analysis, Grant recommended five steps:

1. **Identify segmentation variables and categories:**

The market may be divided into a number of segments using appropriate bases. Some approaches to define market segments are:

Based on customer characteristics	Based on Product
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Geographic Type of organization Size of firm Life-style customers Age Occupation	Use-type Usage Benefits sought Prices sensitivity Competition Brand Loyalty
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2. **Construct a segmentation matrix:** After customer and product-related variables have been selected for identifying different segments, a segmentation matrix can be developed. Two or more dimensions may be used to partition an industry. For example restaurants could be divided into four dimensions; types of cuisine, price range, type of service (e.g. sit-down, buffet, cafeteria, take-out, fast food) and location.
3. **Analyse segment attractiveness:** Competitive assessments using industry structure analysis or core competencies analysis can also be used to evaluate the profitability of different segments. However the competitive focus shifts to an analysis of the different segments. In addition, the interrelationship among segments must be carefully considered.
4. **Identify key success factors for each segment:** Quality, delivery, customer satisfaction market share, profitability and return on investment are common measures of corporate success. In this regard, each segment must be assessed using the most appropriate key success factors. Cost and differentiation advantages should be highlighted by these measures. Examination of differences among segments in buyers' purchase criteria reveal clear differences in key success factors.
5. **Analyse attractiveness of broad versus narrow segment scope:** The competitive advantage of each segment may be identified in terms of low cost and/or differentiation. Sharing costs across different market segments may provide a competitive advantage. Taxing a narrow segment focus may leave a firm vulnerable to competitors. A segment justifying a unique strategy may be of worthwhile size to support a business strategy.

Limitations of Value Chain Analysis

1. **Non-availability of data:** Internal data on costs, revenues and assets used for value chain analysis are derived from financial information of a single period. For long-term strategic decision-making, changes in cost structures, market prices and capital investments etc. may not be readily available.
2. **Identification of stages:** Identifying stages in an industry's value chain, is limited by the ability to locate at least one firm that participates in a specific stage. Breaking a value stage into two or more stages when an outside firm does not compete in these stages is strictly judgment.
3. **Ascertainment of cost, revenues and assets:** Finding the costs revenues and assets for each value chain activity poses/gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.
4. **Identification of cost drivers:** Isolating cost drivers for each value-creating activity, identifying value chain linkages across activities, and computing supplier and customer profit margins present serious challenges.
5. **Resistance from employees:** Value chain analysis is not easily understandable to all employees and hence may face resistance from employees as well as managers.
6. **Science Vs. Art:** Value chain analysis is not an exact science. It is more "art" than preparing precise accounting reports. Certain judgments and factors of analysis are purely subjective and differ from person to person.

Impact of VCA on Organisational and Managerial Accounting

Management Accountants should recognize that the traditional, functional, internally oriented information system is inadequate for the firm engaged in global competition. In order to facilitate Value chain analysis, there should be a change in focus for management accounting. The Management Accountant's role will be significant in the following areas:

1. **Need for education, training and awareness:** Management Accountants should bring the importance of customer value to the forefront of management strategic thinking. They should take the initiative to bring the value chain message to major players in the firm through seminars, articles, value chain examples and company-specific applications.
2. **Exploring for information:** VCA requires expertise in internal operators and information and also demands a great deal of external information. Management accountants must seek relevant financial and non-financial information from sources outside the organization.

3. **Creativity:** Management accountants must integrate databases and potential sources of timely information on competitive forces confronting the business. This calls for innovation and creativity in gathering and analyzing information for management decisions.
4. **System design:** Designing internal and external in to assist managers in planning, monitoring and improving value-creating processes is another challenge facing management accountants.
5. **Cooperation:** Management accountants should solicit support from all senior managers for allocating resources to develop and improve value chain-oriented information systems. The management accountant should ensure that the top management is committed to value chain analysis and the organizational changes necessary for its successful implementation.

Difference between traditional management accounting & value chain analysis.

	Traditional Management Accounting	Value Chain analysis
Focus	Internal	External
Perspective	Seeks cost reduction in Value added process i.e. Sale Price- Cost of Raw materials.	Seeks competitive advantage based on entire set linked activities from suppliers to end-use customs.
Number of Cost Drivers	A single cost driver is adopted. Cost is generally based on volume production and sales.	Multiple cost drivers are adopted i.e: • Structural drivers (e.g. scale, scope, experience, technology and complexity) • Executional drivers (e.g., participation management and plant layout.
Use of Cost Driver	Application at the overall firm level (cost-volume-profit analysis)	A set of unique cost drivers is used for each value activity.
Cost Containment Philosophy	Application at the overall firm level (cost-volume-profit analysis)	A set of unique cost drivers is used for each value activity.
Cost Preferences	Seeks adhoc cost reduction solutions by focusing on variance analysis, performance evaluation based on financial and quantitative data	View cost containment as a function of the cost drivers regulating each value activity. • Exploit linkages with suppliers • Exploit linkages with customers • Exploit process linkages within the firm • "Spend to save"
Nature of Data	Focus on control of manufacturing costs	Focus on gaining advantage and not only on cost control and reduction.
Benchmarking	Partially present Inter-finance comparison, if any, is generally restricted to financial and operational information.	Focus on full-fledged benchmarking learning from competitors but exploiting one's own strengths gain advantage
Insights for Strategic Decisions.	Limited to some extent	Identify cost drivers at the individual activity level and develop cost/differentiation advantage either by controlling those drivers better than competing by reconfiguring the value chain, Quantify and assess "supplier power" and "buyer power" a exploit linkages with suppliers and buyers.

Question 61: What steps are involved in value chain analysis approach for assessing competitive advantages? (4 Marks) May/05

Question 62: What is the concept of 'Value-chain' and why is it important for Cost Management?

(4 Marks) May/06

Ans.: Value chain is the linked set of value creating activities from the basic raw materials and components sources to the ultimate end use of the product or service delivered to the customer.

The six business functions contained in the value chain are (i) Research and Development, (ii) Design (iii) Production (iv) Marketing (v) Distribution and (vi) Customer service.

The objective of value chain is to serve as means of increasing the customer satisfaction and managing costs effectively. Coordination of the individual parts of the value chain activities creates conditions to improve customer satisfaction in terms of cost efficiency, quality and delivery. A firm which performs value chain activities more efficiently and at a lower cost than its competitors will be able to gain competitive advantage. The following methodology should be adopted.

1. The firm should identify the industry value chain and then assign costs, revenues and assets to value activities.
2. Diagnose the cost drivers regulating each value activity.
3. Develop sustainable cost advantage either by controlling cost drivers better than competitors or by reconfiguring the chain value.

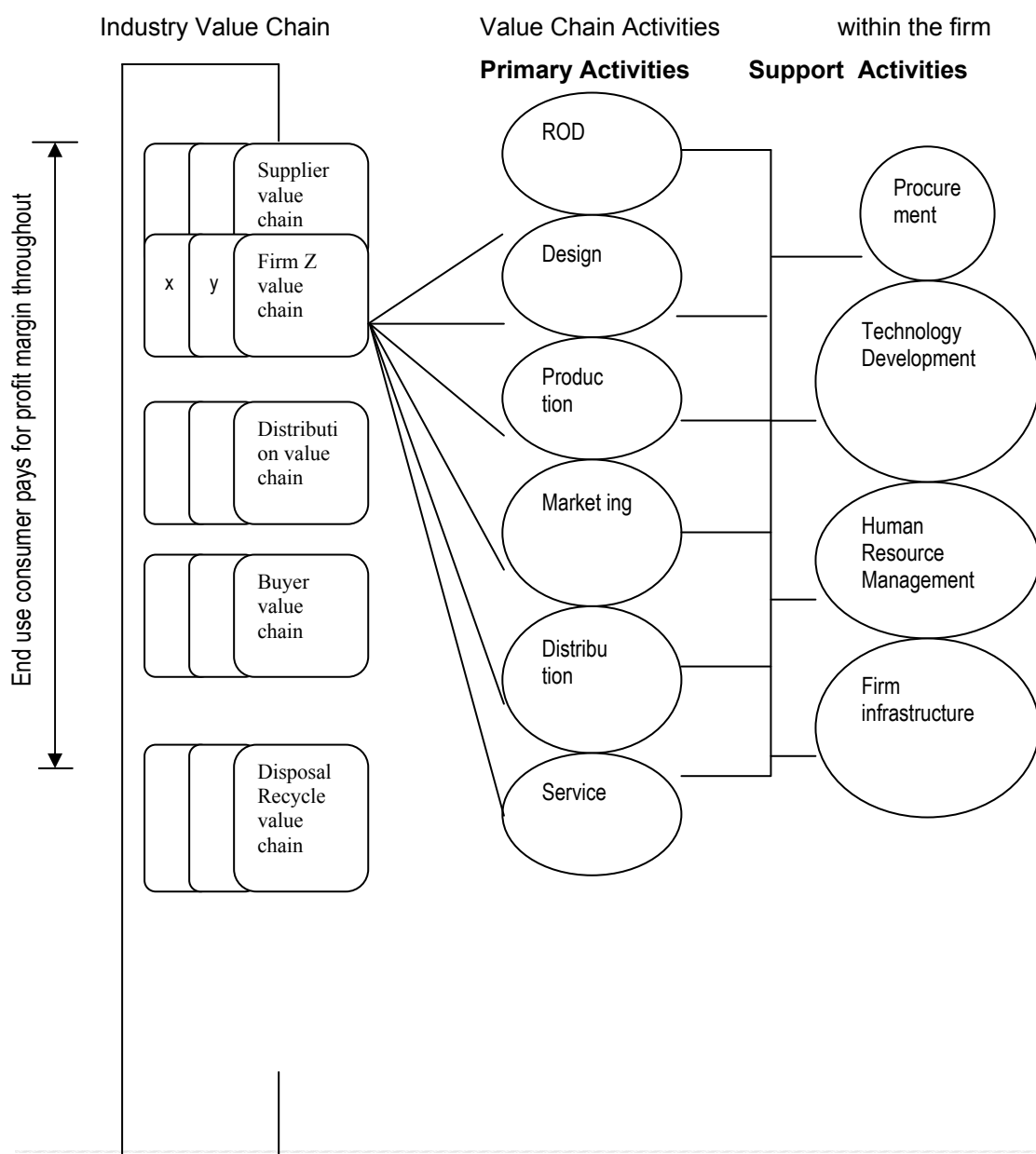
By analyzing costs, revenues and assets in each activity systematically a company can achieve low cost. Thus value chain helps managers in deciding how to apply the organization's valuable physical and human resources to each linked process so as to achieve cost effectiveness.

Question 63: Define the term 'value-chain'. Mention three useful strategic frameworks of the value-chain analysis. (4 Marks) June/09-OC

Question 64: Differentiate between 'Traditional Management Accounting' and 'Value Chain Analysis in the strategic framework'. (5 Marks) Nov./08-NC

Question 65: Explain with a diagram the value chain activities within the firm with suitable classifications under primary and support activities and also the industry value chain indicating what the end use consumer pays for. (5 Marks) Nov./06

Ans.:



MANUFACTURING RESOURCE PLANNING & ENTERPRISE RESOURCE PLANNING

MANUFACTURING RESOURCES PLANNING(MRP I&II)

It is a part of production operation system. Management has to develop a lot of strategies for production plan. In early 1960's a material acquisition plan was first introduced known as Material Requirement Plan (MRP-I). MRP-2 is latest all-round development of that plan.

A brief history of MRP –1

Material requirement planning is a computerized production scheduling system which takes the forward schedule of final product requirements (the master production schedule) and translates it progressively into the numbers of sub-assemblies, components and raw materials required at each stage of the manufacturing cycle.

It is a management information system providing a basis for production decisions when what is manufactured has a composite structure and when lead items are important features. Obviously, the ability of the system to deliver what is required in the correct place at the correct time will be dependent on the quality of information which is put into the computer model.

AIMS OF MATERIAL REQUIREMENT PLANNING:

1. Determine for final products namely, what should be produced and at what time.
2. Ascertaining the required units of production of sub-assemblies.
3. Determining the requirement for materials based on an up-to-date bill of materials file (BOM).
4. Computing inventories, WIP, batch sizes and manufacturing and packaging lead times.
5. Controlling inventory by ordering bought-in components and raw materials in relation to the orders received or forecast rather than the more usual practice of ordering from stock-level indicators.

Benefits: Detailed forecast of the inventory position is highlighted period by period.

DATA REQUIREMENTS TO OPERATE MATERIAL REQUIREMENT PLANNING SYSTEM:

The master Production schedule: This schedule specifies the quantity of each finished unit of products to be produced, and the time at which each unit will be required.

The Bill of material file: The bill of material file specifies the sub-assemblies, components and materials required for each finished good.

The inventory file: This file maintains details of items in hand for each sub-assemblies, components and materials required for each finished goods.

The routing file: This file specifies the sequence of operations required to manufacture components, sub-assemblies and finished goods.

The master parts file: This file contains information on the production time of sub- assemblies and components produced internally and lead times for externally acquired items.

Method of operation of material requirement planning system:

A material requirements planning (MRP) system is a computer based inventory information system which is used to plan and control raw material and component parts inventories.

Like all computer-based information system, MRP systems can be divided into following:

- Pre-requisite information
- System input
- System processing
- System output

Pre-requisite information and system input:

1. The master production schedule (MPS) file states the production goal, generally for a week time, in terms of desired units of production. MRP system first focuses on the forecasted units of production and timing of finished goods demand and the determines the demand for materials, components and sub-assemblies at each stages of production. This makes MRP a push system in which once the scheduled production starts, the output of each department is pushed through the system to the next department for processing or into inventory to be retrieved later.

2. The bill of materials (BOM) file contains information about how the production of the finished goods is undertaken. A bill of material structure is used:

- a) To assess all of the raw materials and component parts required to complete a product, and,
- b) To describe the multiple levels of assembly or manufacturing necessary to complete a unit of finished product.

3. The inventory records files of the MRP system defines current levels of finished goods, raw materials, and component parts inventory at the beginning of some planning period. During the planning period, the organization may receive units of raw materials, components parts, sub-assemblies, and even finished goods inventory from suppliers, vendors, and subcontractors. These planned inventory receipts and delivery lead times are included in the inventory records file so that their addition can be appropriately considered in the time bucket of their arrival.

Pre-requisites for successful operation of MRP:

1. Strict adherence to the schedule: The successful operation of MRP system requires a strict adherence to the latest production and purchasing schedules. Workers must be educated to understand the importance of schedule adherence, and controls should be in place to ensure this adherence.

2. Accurate data base: Data accuracy is vital to the system. If a plan is based on inaccurate data it may be impossible to adhere to the schedule. For example, if the bill of materials file is not updated to reflect any changes in product composition it will be impossible to adhere to the schedule.

MRP- II

When the scope of MRP-1 is developed further, which includes

1. Planning of raw material
2. Planning of component & sub- assemblies
3. Compute the other resources e.g. machine or labour capacity
4. To create a full integrated plan for management

then it is known as Manufacturing resources planning (MRP – 2)

MRPII (also written MRP-2) adds the MRP schedule into a capacity planning system and then builds the information into a production schedule. It is also seen as a link between strategic planning and manufacturing control. The sequence of events is as follows:

From that document, a manufacturing, plan is developed based upon inputs from purchasing & production. Adjustments may be necessary to allow for production rates. Possible inventory levels in seasonal trades & the size of the workforce. The manufacturing plan leads into a detailed master production schedule which is akin to the original philosophy of MRP already outlined.

If correctly applied, MRPII provides a common data base for the different function units such as manufacturing, purchasing and finance within a firm.

ENTERPRISE RESOURCE PLANNING (ERP)

ERP refers to software, which integrates all departments and functions across a company into a single computer system that can serve all those needs of different departments.

It combines all computerized departments together with the help of a single integrated software program that uses a single database so that various departments can more easily share information and communicate with each other.

Need for ERP:

1. **Complete Automation and Faster Service:** ERP automates the tasks involved in performing a business process such as order fulfillment, which involves taking an order from a customer, shipping it and billing for it. The order process moves like a bolt of lightning through the organization, and customers get their orders faster and with fewer errors than before. Similarly, the major business processes like employee benefits or financial reporting can be speeded up.
2. **Standardized Processes:** Manufacturing companies find that multiple business units (departments) across the company adopt different methods and computer systems for the same product. Standardizing these using a single integrated computer system can save time and increase productivity.
3. **Integrated Financial Data:** ERP creates a single version of the financial position and performance that cannot be questioned because everyone is using the same system. It is very useful

in analyzing the performance and deviations of different business units (responsibility centres) rather than obtaining individual reports from each such business unit.

4. **Standardised HR Information:** HR may not have a unified, simple method for tracking employee time and communicating with them about benefits and services. ERP can help companies with multiple business units in this regard.
5. **Tailor-made:** ERP systems are designed as per the requirements of individual companies based on the nature, scale and methods of operations. It is superior to other standardized application packages (software), which may not be fully useful to a multifaceted company.
6. **Information Management:** A good MIS should avoid information overload, ERP helps proper information management since all data are made available at one place, accessible to different users based on their individual requirements.

Components of ERP:

The following may be identified as the primary components (sub-systems) of ERP system:

Sales and marketing	Shop floor control
Master scheduling	Accounts payable/receivable
Material requirement Planning	Logistics
Capacity requirement planning	Asset Management
Bill of materials Purchasing	Financial Accounting

Features of ERP:

1. **Integrated:** ERP facilitates company-wide information integration covering all functional areas like manufacturing, selling and distribution, payables, receivables, inventory, accounts, human resources, etc. ERP provides complete integration of systems not only across departments but also across companies under the same management.
2. **Information Sharing:** ERP bridges the information gap across organizations.
3. **Project Management:** ERP is the solution for better project management
4. **E-Com Facilities:** ERP allows automatic introduction of technologies like Electronic Fund Transfer (EFT), Electronic Data Interchange (EDI), Internet, Intranet, Video Conferencing, E-Commerce etc.
5. **Business Decision Making Solution:** ERP provides business intelligence tools like Decision Support systems (DSS), Executive Information System (EIS), Reporting, Data Mining and Early warning systems (Robots) for enabling people to make better decisions. It eliminates most business problems like material shortage, productivity enhancements, customer service, cash management, inventory problems, quality problems, prompt delivery etc.
6. **Futuristic:** ERP not only addresses the current requirements of the company but also provides the opportunity of continually improving and refining business processes.

Benefits of ERP:

1. **Product Costing:** ERP system supports advanced costing methods like Standard Costing, Actual Costing, Activity based costing, thereby helping in determination of cost products accurately.
2. **Cost Monitoring and Control:** ERP can integrate all costing methods and information with finance. This provides the company with essential financial information or monitoring and controlling costs.
3. **Planning and Managing:** The ERP system simplifies complicated logistics and helps in planning for and managing different divisions in different locations as a single unit.
4. **Information Flow:** The advanced utility of the ERP system helps in processing the flow of product and financial information in several different ways.
5. **Efficient Database Management:** The ERP system aids in the efficient managing of data on warehouse, suppliers customers etc. required to run an organization effectively and profitably.
6. **Inventory Management:** Inventory reporting supports all reporting of specific and general types of stock transactions like stock transfers, reclassifications, ID changes and physical inventory results. Also ERP can manage stock and purchase requisitions selections of appropriate locations for receipts, inventory valuation, warehouse management and cost accounting.
7. **Customer Satisfaction:** ERP system defines the logistics processes flexibly and efficiently to deliver the right product from the right warehouse to the right customer at the right time – every time, thereby satisfying the customers. It also supports planning transportation, confirmation, dispatch and proof of delivery processing. Additionally, it ensures better after sales service.
8. **Competitive Edge:** ERP system helps a company to gain the Competitive Edge by (a) enabling the company to respond quickly and accurately to change in market conditions; (b) improving business

process (c) ensuring quality control; (d) improved and objective production planning; intranet and Extranet Solutions.

Question 66: Write short notes on Material Requirement Planning (5 Marks) May/02

Question 67: State the major features of Enterprise Resource Planning (ERP) (4 Marks) Nov./07, (3 Marks) May/03 & (4 Marks) Nov./02

Question 68: State the benefits accruing from Enterprise Resource Planning (ERP) (4 Marks) May/04

Question 69: (i) What do you mean by ERP? (2 Marks) Nov./06

(ii) Name six benefits of ERP in an enterprise. (3 Marks) Nov./06

Newly Introduced Theory Topics

COMPUTER-AIDED MANUFACTURING

The manufacturing process is carried out by a range of machinery that, together with its concomitant software, comes under the collective heading of computer-aided manufacturing (CAM).

Maximum elements of CAM are computer numerical control (CNC) and robotics.

CNC machines are programmable machine tools. These are capable of performing a number of machining tasks, e.g. cutting, grinding, moulding, bending etc.

A program stores all the existing manufacturing activities and set-up instructions for a particular machine or bank of machines, providing facility of changing its configuration in a matter of seconds via the keyboard; changes to existing configurations and new configurations are easily accommodated. CNC therefore offers great flexibility, and reduces set-up times.

Human operators will tire and are error prone. CNC machines are able to repeat the same operation continuously in identical manner, with high accuracy level.

For Example the car producer, found that the time taken to completely retool car body panel jigs in their intelligent body assembly system (IBAS) fell from 12 months to less than

3 months by reprogramming the process machinery by computer and using computerised jig robots.

SYNCHRONOUS MANUFACTURING

This concept of 'synchronous manufacturing' was started in 1984. It has been defined as: an all-encompassing manufacturing management philosophy that includes a consistent set of principles, procedures, and techniques where every action is evaluated in terms of the common global goal of the organisation.

A set of seven 'principles' are associated with synchronous manufacturing:

1. Do not focus on balance idle capacities; focus on synchronizing the production flow.
2. The marginal value of time at a bottleneck resource is equal to the throughput rate of the products processed by the bottleneck.
3. The marginal value of time at a non-bottleneck resource is negligible.
4. The level of utilization of a non-bottleneck resource is controlled by other constraints within the system.
5. Resources must be utilized, not simply activated.
6. A transfer batch may not, and many times should not, be equal to the process batch.
7. A process batch should be variable both along its route and over time.

According to synchronous manufacturing principles 2 and 3, the return on improvements at a bottleneck resource is very high. But the return on improvement made at non-bottlenecks is marginal at best.

The synchronous manufacturing philosophy required managers to focus on those areas of operations where there exist potential global improvements.

BUSINESS PROCESS RE-ENGINEERING

Business process re-engineering involves examining business processes and making substantial changes in the day to day operation of the organisation. It involves the redesign of work by changing the activities.

A business process consists of a collection of activities that are linked together in a co-ordinated & Sequential manner to achieve goal & objective.

For example, material handling might be classed as

- ❖ Scheduling production,
- ❖ Storing materials,
- ❖ Processing purchase orders,
- ❖ Inspecting materials, and,
- ❖ Paying suppliers.

The aim of business process re-engineering is to improve the key business process in an organisation by focusing on

- ❖ Simplification,
- ❖ Cost reduction,
- ❖ Improved quality, and,
- ❖ Enhanced customer satisfaction

UNIFORM COSTING

When several undertakings start using the same costing principles and/or practices they are said to be following uniform costing. The basic idea behind uniform costing is that the different concerns in an industry should adopt a common method of costing and apply uniformly the same principles and techniques for better cost comparison and common good. The principles and methods of compilation, analysis, apportionment and absorption of overheads differ from one concern to the other in the same industry; but if a common or uniform pattern is adopted by all, it helps mutually in cost control and cost reduction. Therefore, it is necessary that a uniform method of costing should be adopted by the member unit of an industry.

Objectives of Uniform Costing: The main objectives of Uniform Costing are as follows :—

1. To facilitate the comparison of costs and performances of different units in the same industry; it provides objective basis.
2. To eliminate unhealthy competition among the different units of an industry.
3. To improve production capacity level and labour efficiency by comparing the production costs of different units with each other.
4. To provide relevant cost information/data to the Government for fixing and regulating prices of the products.
5. To bring standardization and uniformity in the operation of participating units.
6. To reduce production, administration, selling and distribution costs, and to exercise control on fixed costs.

Essential requisites for the installation of Uniform Costing System: A successful system of uniform costing has the following requirements :—

- i. The firms in the industry should be willing to share/furnish relevant data/information.
- ii. A spirit of cooperation and mutual trust should prevail among the participating firms.
- iii. Mutual exchange of ideas, methods used, special achievements made, research and know-how etc. should be frequent.
- iv. Bigger firms should take the lead towards sharing their experience and know-how with the smaller firms to enable the latter to improve their performance.
- v. Uniformity must be established with regard to several points before the introduction of uniform costing in an industry. In fact, uniformity should be with regard to following points:
 - (a) Size of the various units covered by uniform costing.
 - (b) Production methods.
 - (c) Accounting methods, principles and procedures used.

Advantages of Uniform Costing: The advantages accruing from the use of uniform costing system are as follows:

- i. The management of each firm will be saved from the exercise of developing and introducing a costing system of its own.
- ii. A costing system devised by mutual consultation and after considering the difficulties and circumstances prevailing in different firms is readily adopted and successfully implemented.
- iii. It facilitates comparison of cost figures of various firms to enable the firms to identify their weak and strong points besides controlling costs.
- iv. Optimum achievement of efficiency is attempted by all the firms by utilizing the experience of other concerns in the industry.
- v. Standing in the industry of each firm will be known by making a comparison of its cost data with others.

- vi. Services of cost consultants or experts may be available jointly to each firm in the industry by sharing their experiences and expenses.
- vii. Research and development benefits of bigger firms may be made available to smaller firms.
- viii. It helps in the reduction of labour turnover, as a uniform wage system is the pre-condition of a uniform costing system.
- ix. It helps Trade Associations in negotiating with the Government for any assistance or concession in the matters of taxation, exports, subsidies, duties and prices determination etc.
- x. Unhealthy competition is avoided among the firms in the same industry in framing pricing policies and submitting tenders.
- xi. Prices fixed on the basis of uniform costing are representative of the whole industry and thus are reliable.
- xii. Uniform costing provide a basis for the comparative assessment of the performance of two firms in the same industry but in different sectors.
- xiii. It helps the Government in regulating the prices of essential commodities such as bread, sugar, cement, steel etc.

Limitations of Uniform Costing:

- i. Sometimes it is not possible to adopt uniform standards, methods and procedures of costing in different firms due to differing circumstances in which they operate. Hence, the adoption of uniform costing becomes difficult in such firms.
- ii. Disclosure of cost information and other data is an essential requirement of a uniform costing system. Many firms do not wish to share such information with their competitors in the same industry.
- iii. Small firms in an industry believe that uniform costing system is only meant for big and medium size firms, because they cannot afford it.
- iv. It induces monopolistic trend in the business, due to which prices may be increased artificially and supplies withheld.

Question 30: What are the requisites for the installation of a uniform costing system? (4 Marks) Nov./08-NC

Question 31: What is uniform costing? Why it is recommended?

(4 Marks) June/09-NC

INTER-FIRM COMPARISON

It is technique of evaluating the performance, efficiency, costs and profits of firms in an industry. It consists of voluntary exchange of information/data concerning costs, prices, profits, productivity and overall efficiency among firms engaged in similar type of operations for the purpose of bringing improvement in efficiency and indicating the weaknesses. Such a comparison will be possible where uniform costing is in operation.

An inter-firm comparison indicates the efficiency of production and selling, adequacy of profits, weak spots in the organisation, etc. and thus demands from the firm's management an immediate suitable action. Inter-firm comparison may enable the management to challenge the standards which it has set for itself and to improve upon them in the light of the current information gathered from more efficient units. Such a comparison may be carried out in electrical industry, printing firms, cotton spinning firms, pharmaceuticals, cycle manufacturing, etc.

Requisites of inter-firm comparison system: The following requisites should be considered while installing a system of inter-firm comparison:

- 1. Centre for Inter-Comparison — For collection and analyzing data received from member units, for doing a comparative study and for dissemination of the results of study a Central body is necessary. The functions of such a body may be:
 - i. Collection of data and information from its members;
 - ii. Dissemination of results to its members;
 - iii. Undertaking research and development for common and individual benefit of its members;
 - iv. Organising training programmes and publishing magazines.
- 2. Membership - Another requirement for the success of inter-firm comparison is that the firms of different sizes should become members of the Centre entrusted with the task of carrying out inter-firm comparison.
- 3. Nature of information to be collected - Although there is no limit to information, yet the following information useful to the management is in general collected by the Centre for inter-firm comparison.
 - i. Information regarding costs and cost structures.
 - ii. Raw material consumption.
 - iii. Stock of raw material, wastage of materials, etc.

- iv. Labour efficiency and labour utilisation.
 - v. Machine utilisation and machine efficiency.
 - vi. Capital employed and Return on capital.
 - vii. Liquidity of the organisation.
 - viii. Reserve and appropriation of profit.
 - ix. Creditors and debtors.
 - x. Methods of production and technical aspects.
4. Method of Collection and presentation of information - The Centre collects information at fixed intervals in a prescribed form from its members. Sometimes a questionnaire is sent to each member; the replies of the questionnaire received by the Centre constitute the information/data. The information is generally collected at the end of the year as it is mostly related with final accounts and Balance Sheet. The information supplied by firms is generally in the form of ratios and not in absolute figures. The information collected as above is stored and presented to its members in the form of a report. Such reports are not made available to non-members.

Advantages of Inter-firm comparison::

- a) Such a comparison gives an overall view of the industry as a whole to its members– the present position of the industry, progress made during the past and the future of the industry.
- b) It helps a concern in knowing its strengths or weaknesses in relation to others so that remedial measures may be taken.
- c) It ensures an unbiased specialized reporting on particular problems of the concern.
- d) It develops cost consciousness among members of the industry.
- e) It helps Government in effecting price regulation.
- f) It helps to improve the quality of products manufactured and to reduce the cost of production. It is thus advantageous to the industry as well as to the society.

Limitations of inter-firm comparison

- a) Top management feels that secrecy will be lost.
- b) Middle management is usually not convinced with the utility of such a comparison.
- c) In the absence of a suitable Cost Accounting System, the figures supplied may not be reliable for the purpose of comparison.
- d) Suitable basis for comparison may not be available.

PROFITABILITY STATEMENTS

Direct product profitability (DPP) : As traditional absorption costing, which normally uses labour hours as a basis for absorption, is rarely suitable for service and retail organisations other methods had to be devised. One relatively new way of spreading overheads in retail organisations, which is used in the grocery trade in particular, is direct product profitability (DPP). DPP started in the USA in the 1960s at General Electric, and was then taken up and used by Proctor and Gamble in the 1980s. In 1985 the Food Marketing Institute in the USA laid down a standard approach to the system and two years later DPP was taken up by the Institute of Grocery Distribution in the U.K. The system described below was introduced in the late 1980s and has since undergone transformation as activity based costing.

In recent years DPP has developed considerably in parallel with activity-based costing. DPP has become much more sophisticated and is now very similar to activity-based costing. One of the reasons for its development during the 1990s has been the development of EPOS and EFTPOS (electronic point of sale and electronic funds transfer) systems that have enabled access to the detailed data needed for direct product cost and profitability calculations.

Benefits of DPP

- ☒ Better cost analysis
- ☒ Better pricing decisions
- ☒ Better management of stores and warehouse space
- ☒ The rationalisation of product ranges.

Direct product profitability statement : Retail organisations traditionally deducted the bought- in cost of goods from the selling price to give a gross margin. The gross margin is useless measure for controlling the costs of the organisation itself or making decisions about the profitability of the different products. This is

because none of the costs generated by the retail organisation itself are included in its calculation. For example, it does not include the storage costs of the different goods and these costs vary considerably from one good to another. A method was needed which related the indirect costs to the goods according to the way the goods used or created these costs.

Indirect costs, for DPP may be analysed into basic cost categories as follows:

- (i) Overhead cost : This is incurred through an activity that is not directly linked to a particular product.
- (ii) Volume related cost : The cost is incurred in relation to the space occupied by products.

This includes storage and transport costs.

- (iii) Product batch cost : This cost is often a time based cost. If product items (that is a number of identical products which are handled together as a batch) are stocked on shelves a labour time cost is incurred.

- (iv) Inventory financing costs : This is the cost of tying up money in stock and is the cost of the product multiplied by interest rate per day or per week.

Customer profitability analysis : In many organisations it is just as important to cost customers as it is to cost products. Different customers or groups of customers differ in their profitability. This is a relatively new technique that ABC makes possible because it creates cost pools for activities. Customers use some activities but not all, and different groups of customers have different 'activity profiles'.

Service organisations, such as a bank or a hotel, in particular need to cost customers. A bank's activities for a customer will include the following types of activities:

- Withdrawal of cash
- Unauthorised overdraft
- Request for a statement
- Stopping a cheque
- Returning a cheque because of insufficient funds.

Different customers or categories of customers will each use different amounts of these activities and so customer profitability profiles can be built up, and customers can be charged according to the cost to serve them. A hotel may have activities that are provided for specific types of customers, such as well laid-out gardens, a swimming pool and a bar. Older guests may appreciate and use the garden, families use the swimming pool and business guests use the bar. If the activities are charged to the relevant guests a correct cost per bed occupied can be calculated for this type of category. This will show the relative profitability and lead to strategies for encouraging the more profitable guests.

Even a manufacturing organisation can benefit from costing its customers. Not all customers cost the same to serve even if they require the same products. Some customers may be located a long way from the factory and transport may cost more. Other customers may be disruptive and place rush orders that interrupt production scheduling and require immediate, special transport. Some customers need after sales service and help with technical matters, etc.

Benefits of customer profitability analysis.

1. It helps the supplier to identify which customers are eroding overall profitability and which customers are contributing to it.
2. It can help to provide a basis for constructive dialogue between buyer and seller to improve margins.