

SREERAM COACHING POINT



COST Management

Test Questions & Suggested Solutions

by

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COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Question: 1

Bharata Ltd is considering proposals for design changes in one of a range of soft toys. The proposals are as follows:

- (a) Eliminate some of the decorative stitching from the toy.
- (b) Use plastic eyes instead of glass eyes in the toys (two eyes per toy).
- (c) Change the filling material used. It is proposed that scrap fabric left over from the body manufacture be used instead of the synthetic material which is currently used.

The design change proposals have been considered by the management team and the following information has been gathered:

- (a) Plastic eyes will cost Rs.15 per hundred whereas the existing glass eyes cost Rs.20 per hundred. The plastic eyes will be more liable to damage on insertion into the toy. It is estimated that scrap plastic eyes will be 10% of the quantity issued from stores as compared to 5% of issues of glass eyes at present.
- (b) The synthetic filling material costs Rs.80 per tonne. One tonne of filling is sufficient for 2,000 soft toys.
- (c) Scrap fabric to be used as filling material will need to be cut into smaller pieces before as and this will cost Rs.0.05 per soft toy. There is sufficient scrap fabric for the purpose.
- (d) The elimination of the decorative stitching is expected to reduce the appeal of the product, with an estimated fall in sales by 10% from the current level. It is not felt that the change in eyes or filling material will adversely affect sales volume. The elimination of the stitching will reduce production costs by Rs.0.60 per soft toy.
- (e) The current sales level of the soft toy is 3,00,000 units per annum. Apportioned fixed costs per annum are Rs.4,50,000. The net profit per soft toy at the current sales level is Rs.3.

Required:

- (i) Using the information given in the question, prepare an analysis which shows the estimated effect on annual profit if all three proposals are implemented, and which enables management to check whether each proposal will achieve an annual target profit increase of Rs.25,000. The proposals for plastic eyes and the use of scrap fabric should be evaluated after the stitching elimination proposal has been evaluated.
- (ii) Calculate the percentage reduction in sales due to the stitching elimination at which the implementation of all three design change proposals would result in the same total profit from the toy as that earned before the implementation of the changes in design.

Question:2

ABC Ltd manufactures a simple garden tool. At present the company is working at full capacity producing the three components A,B,C one of each being required for the assembly of the tool. All the machines are capable of making all the components. Current cost data concerning hundred tools are as follows:

	Machine Hours	Variable Cost Rs.	Fixed Cost Rs.	Total Rs.
Components - A	10	26	10	36
Components - B	16	32	2	44
Components - C	20	32	32	64
	-	42	22	74
Assembly	46	142	76	218
Selling Price				250

The management is engaged in preparing next year's budget an increase in sales is to be provided for. The factory already has to work at full machine capacity to meet current demand and no increase in the present machine capacity can be effected for over 12 months. Though facilities involving variable costs can be increase data very short notice. It is decided that one of the components will have to be bought out. The following quotations have been received:

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Components		Rs
A	Price per 100 tools	36
B	Price per 100 tools	46
C	Price per 100 tools	54

The Sales manager feels sure that he can sell at least 50% more tools than at present and probably 75% more provided the factory capacity is available.

You are required to prepare a report for management giving your recommendations as to which component should be ordered from outside supplied for the coming year if production is increased by 50% and 75% respectively.

Question : 3

The Chakrapani Ltd's Cost behaviour is as follows:

Production range in units	Fixed cost
0- 20000	Rs. 160000
20001 - 65000	Rs. 190000
65001 - 90000	Rs. 210000
90001 - 100000	Rs. 250000

At an activity of 70000 units per year, variable costs total 280000. Full capacity is 100000 units per year.

Required:

- (1) Production is now set at 50000 units per year with a sales price of Rs.7.50 per unit. What is the minimum number of additional units needed to be sold in an unrelated market at Rs.5.50 per unit to show a net profit of Rs.3000 per year?
- (2) Production is now set at 60000 units per year. By how much may sales promotion costs be increased to bring production up to 80000 units and still earn a net profit of 5% of total sales if the selling price is held at Rs.7.50?
- (3) If net profit is currently Rs.10000 with fixed costs at Rs.160000 and a 2% increase in price will leave units sold unchanged but increase profits by Rs.5000. What is the present volume in units?

Question: 4

The manager of a business has received enquiries about printing three different types of advertising leaflet. Information concerning these three leaflets is shown below:

	A	B	C
Selling prices per 1000 leaf lets	100	220	450
Estimated printing costs:			
Variable per 1000 leaflets	40	70	130
Specific fixed costs per month	2,400	4,000	9,500

In addition to specific fixed costs a further Rs. 4,000/- per month would be incurred in renting special premises if any or all of the above three leaflets were printed. The minimum printing order would be for 30,000 of each type of leaflet per month and the maximum possible order is estimated to be 60,000 of each leaflet per month.

Required

- (i) Examine and comment upon the potential profitability of leaflet printing. Make whatever calculations you consider appropriate.
- (ii) Assuming that orders have been received to print each month 50,000 of both leaflet A and leaflet B calculate the quantity of leaflet C which would need to be ordered to produce an overall profit, for all three leaflets of Rs. 1,800/- per month.

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- (iii) It is possible that a special type of paper used in printing leaflets will be difficult to obtain during the first few months. Three estimated consumption of this special paper for each type of leaflet is:

Leaflet	A	2 packs per	1000 leaflets
Leaflet	B	6 packs per	1000 leaflets
Leaflet	C	6 packs per	1000 leaflets

Advise the manager on the quantity of each leaflet which should be printed in order to maximise profit in the first month, if 50,000 of each type of leaflet have been printed there remains unfulfilled order of 10,000 for each type of leaflet and there 170 packs of special paper available for the rest of the month. What will be your reaction if the printing quantity is to be pack of 1000 leaflets.

Question: 5

For the past 20 years a charity organisation has held an annual dinner and dance with the primary intention of raising funds.

This year there is concern that an economic recession may adversely affect both the number of persons attending the function and the advertising space that will be sold in the programme published for the occasion.

Based on past experience and current prices and quotations, it is expected that the following costs and revenues will apply for the function.

			(Rs.)
Costs:	Dinner and dance:	Hire of premises	700
		Band and entertainers	2,800
		Raffle prizes	800
		Photographer	200
		Food at Rs.12 per person (with a guarantee of 400 persons minimum)	
	Programme:	A fixed cost of Rs.2,000, plus Rs.5 per page	
Revenues:	Dinner and dance:	Price of tickets	Rs.20 per person
		Average revenue from :	
		Raffle	Rs.5 per person
		Photographs	Re.1 per person
	Programme:	Average revenue from advertising	Rs.70 per page

A sub-committee, formed to examine more closely the likely outcome of the function, discovered the following from previous records and accounts:

No. of tickets sold	No. of past occasions
250 to 349	4
350 to 449	6
450 to 549	8
550 to 649	2
	20

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No. of programme pages sold	No. of past occasions
24	4
32	8
40	6
48	2
	20

Several members of the sub-committee are in favour of using a market research consultant to carry out a quick enquiry into the likely number of tickets and the likely number of pages of advertising space that would be sold for this year's dinner and dance.

You are required to:

- (a) Calculate the expected value of the profit to be earned from the dinner and dance this year;
- (b) Recommend, with relevant supporting financial and cost data, whether or not the charity should spend Rs.500 on the market research enquiry and indicate the possible benefits the enquiry could provide.

NB: All workings for tickets should be in steps of 100 tickets and for advertising in steps of 8 pages.

Question: 6

The budgeted production for period 7 in the finishing department of a pottery manufacturer is, 4,500 cups, 4,000 saucers and 6,250 plates. In one standard hour a direct operative is expected to be able to finish either, 30 cups, or 40 saucers, or 25 plates. During period 7, 400 direct labour hours were worked and actual production was, 4,260 cups, 6,400 saucers and 3,950 plates.

Required:

Using the above information calculate for period 7:

- (i) The productivity of the direct operatives;
- (ii) An appropriate ratio expressing the department's actual production relative to that budgeted;
- (iii) Another ratio which you consider may be useful to management and explain the meaning of the ratio you have calculated.

Question: 7

The Bashyam Co Ltd manufactures a variety of products of basically similar composition. Production is carried on by subjecting the various raw materials to a number of standardised operations, each major series of operations being carried out in a different department. All products are subject to the same initial processing which is carried out in departments A, B and C; the order and extent of further processing then depending upon the type of end product to be produced.

It has been decided that a standard costing system could be usefully employed within Bashyam and pilot scheme to be operated for six months based initially only on department B, the second department in the initial common same of operations. If the pilot scheme produces useful results then a management accountant will be employed and the system would be incorporated as appropriate throughout the whole firm.

The standard cost per unit of output of department B is:

		Rs.	Rs.
	Direct labour (14 hours at Rs.2 per hour)		28
	Direct material		
(i)	Output of department A (3 kg at Rs.9 per kg)	27	
(ii)	Acquired by and directly input to department		

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	B material X (4 kg at Rs.5 per kg)	20	47
	Variable overhead (at Rs.1 per direct labour hours worked)		14
	Fixed production overheads		
(i)	Directly incurred by department B - (note 1)		
	manufacturing overhead (per unit)	3	
(ii)	Allocated to department B general factory overhead (per unit)	8	11

Note 1. Based on normal monthly production of 400 units.

In the first month of operation of the pilot study (month 7 of the financial year), department B had no work in progress at the beginning and the end of the month. The actual costs allocated to department B in the first month of operation were:

		Rs.	Rs.
	Direct labour (6,500 hours)		14,000
	Direct materials		
(i)	Output of department A (1,400 kg) - (note 2)	21,000	
(ii)	Material X (1,000 kg)	11,500	32,500
	Variable overhead		8,000
	Fixed overhead		
(i)	Directly incurred manufacturing overhead	1,600	
(ii)	Allocated to department B - (note 3)	2,900	4,500
			Rs.59,000

Note 2. Actual cost of output of department A.

Note 3. Based on the actual expenditure on joint manufacturing overheads and allocated to departments in accordance with labour hours worked

The production manager feels that the actual costs of Rs.59,000 for production of 500 units indicates considerable inefficiency on the part of department B. he says, 'I was right to request that the pilot standard costing system be carried out in department B as I have suspected that they are inefficient and careless - this overspending of Rs.9,000 proves I am right'.

Required:

Prepare a brief statement which clearly indicates the reasons for the performance of department B and the extent to which that performance is attributable to department B. the statement should utilize variance analysis to the extent it is applicable and relevant.

Question: 8

- (i) Mathanakesari Ltd manufactures and sells a single product. In the quarter to 30 November 2002 sales of 10,000 units were budgeted at a unit selling price of Rs.5 and a unit contribution of Rs.1 (after charging variable costs). The budget had been prepared in the previous spring, and proved to be inaccurate. Actual sales for the November quarter were 7,000 units at a unit selling price of Rs.8, giving a unit contribution of Rs.3.

You are required to calculate appropriate sales margin variances on the basis of this information.

- (ii) When reviewing the results for the quarter to 30 November the sales manager ascertained several additional facts.

The total market for the product nationally had been only 45,000 units during the quarter, and not 50,000 units as Mathanakesari had originally anticipated. Mathanakesari had previously maintained a 20% share

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of the market for many years, adopting a policy of matching the market price. An index of the selling price levels of competitors' products had risen to 140, instead of remaining at the level of 100 as originally budgeted. Mathanakesari's variable costs (all materials) had risen in line with the change in the appropriate commodity price index, which had gone up from the expected level of 100 to an actual level of 125.

You are required to calculate a set of variances to take appropriate notice of this additional information, and to discuss their significance.

Question: 9

From past experience a company operating a standard cost system has accumulated the following information in relation to variances in its monthly management accounts:

		Percentage of total number of variances.
(1)	Its variances fall into two categories:	
	Category 1: those which are not worth investigating	64
	Category 2: those which are worth investigating	36
		100

(2) Of category 2, corrective action has eliminated 70% of the variances, but the remainder have continued.

(3) The cost of investigation averages Rs.350 and that of correcting variances averages Rs.550.

(4) The average size of any variance not corrected is Rs.525 per month and the company's policy is to assess the present value of such costs at 2% per month for a period of five months.

You are required to:

- (a) Prepare two decision trees, to represent the position if an investigation is:
 - (i) Carried out;
 - (ii) Not carried out;
- (b) Recommend, with supporting calculations, whether or not the company should follow a policy of investigating variances as a matter of routine;
- (c) Explain briefly two types of circumstance that would give rise to variances in Category 1 and two to those in Category 2;
- (d) Mention any one variation in the information used that you feel would be beneficial too the company if you wished to improve the quality of the decision-making rule recommended in (b) above. Explain briefly why you have suggested it.

Question: 10

Vishwakarma is a builder. His business will have spare capacity over the coming six months and he has been investigating two projects.

Project A

Vishwakarma is tendering for a school extension contract. Normally he prices a contract by adding 100% to direct costs, to cover overheads and profit. He calculates direct costs as the actual cost of materials valued on a first-in-first-out basis, plus the estimated wages of direct labour. But for this contract he has prepared more detailed information.

Four types of material will be needed:

Matl.	Quantity (units):		Price per unit: (in Rs.)		
	Needed for contract	Already in stock	Purchase price of units in stock	Current Purchase price	Current resale price
Z	1,100	100	7.00	10.00	8.00
Y	150	200	40.00	44.00	38.00
X	600	300	35.00	33.00	25.00
W	200	400	20.00	21.00	10.00

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Z and Y are in regular use. Neither X nor W is currently used; X has no foreseeable use in the business, but W could be used on other jobs in place of material currently costing Rs.16 per unit.

The contract will last for six months and requires two craftsmen, whose basic annual wage cost is Rs.16,000 each. To complete the contract in time it will also be necessary to pay them a bonus of Rs.700 each. Without the contract they would be retained at their normal pay rate, doing work which will otherwise be done by temporary workers engaged for the contract period at a total cost of Rs.11,800.

Three casual labourers would also be employed specifically for the contract at a cost of Rs.4,000 each.

The contract will require two types of equipment: general- purpose equipment already owned by Vishwakarma, which will be retained at the end of the contract, and specialized equipment to be purchased second-hand, which will be sold at the end of the contract.

The general-purpose equipment cost Rs.21,000 two years ago and is being depreciated on a straight-line basis over a seven-year life (with assumed zero scrap value). Equivalent new equipment can be purchased currently for Rs.49,000. Second-hand prices for comparable general-purpose equipment, and those for the relevant specialized equipment, are shown below.

	General - purpose equipment		Specialized equipment	
	Purchase Price (Rs.)	Resale Price (Rs.)	Purchase Price (Rs.)	Resale Price (Rs.)
Current	20,000	17,200	9,000	7,400
After 6 months:				
If used for 6 months	15,000	12,600	7,000	5,800
If not used	19,000	16,400	8,000	6,500

The contract will require the use of a yard on which Vishwakarma has a four-year lease at a fixed rental of Rs.2,000 per year. If Vishwakarma does not get the contract the yard will probably remain empty. The contract will also incur administrative expenses estimated at Rs.5,000.

Project B

If Vishwakarma does not get the contract he will buy a building plot for Rs.20,000 and build a house. Building costs will depend on weather conditions:

Weather condition	A	B	C
Probability	0.4	0.4	0.2
Building costs (excluding land)	Rs.60,000	Rs.80,000	Rs.95,000

Similarly the price obtained for the house will depend on market conditions:

Market condition	D	E
Probability	0.7	0.3
Sale price (net of selling expenses)	Rs.1,00,000	Rs.1,20,000

Vishwakarma does not have the resources to undertake both projects. The costs of his supervision time can be ignored.

Requirements:

- (a) Ignoring the possibility of undertaking project B, calculate:
 - (i) The price at which Vishwakarma would tender for the school extension contract if he used his normal pricing method, and
 - (ii) The tender price at which you consider Vishwakarma would neither gain nor lose by taking the contract.
- (b) Explain, with supporting calculations, how the availability of project B should affect Vishwakarma's tender for the school extension contract.

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Question: 11

Narendran Products has two main products. X and Y, which have unit costs of Rs.12 and Rs.24 respectively. The company uses a markup of 33% in establishing its selling prices and the current prices are thus Rs.16 and Rs.32. With these prices, in the year which is just ending, the company expects to make a profit of Rs.3,00,000 from having produced and sold 15,000 units of X and 30,000 units of Y. This programme will have used all the available processing time in the finishing department. Each unit of X requires an hour of processing time in this department and every unit of Y correspondingly requires half an hour.

Fixed overhead was Rs.3,60,000 for the year and this has been charged to the products on the basis of the total processing hours used. All other costs may be assumed variable in relation to processing hours. In the current year it is estimated that Rs.60,000 of the fixed overhead will be absorbed by X and Rs.3,00,000 by Y. With the existing selling prices it is considered that the potential annual demand for X is 20,000 units and that for Y, 40,000 units.

You are required to comment critically on the product mix adopted by Narendran Products. Calculate what would have been the optimal plan given that there was no intention of changing the selling prices.

- (a) For the forthcoming year increased capacity has been installed in the finishing department so that this will no longer be a constraint for any feasible sales programme. Annual fixed overhead will be increased to Rs.4,00,000 as a consequence of this expansion of facilities, but variable costs per unit are unchanged.

A study commissioned by the Sales Director estimates the effect that alterations to the selling prices would have on the sales that could be achieved. The following table has been prepared:

	X		Y	
Price	Rs.13.50	Rs.18.50	Rs.29.00	Rs.35.00
Demand ('000)	30	10	60	20

It is thought reasonable to assume that the price/demand relationship is linear. Assuming that the company is now willing to abandon its cost plus pricing practices, if these can be shown to be deficient, you are required to calculate the optimal selling price for each product and the optimal output levels for these prices. State clearly any assumptions that you find it necessary to make.

Question: 12

Division A of a large divisionalized 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 costs of Division A's product are as follows:

	(Rs.)
Direct material	4
Direct labour	2
Direct expense	2
Variable manufacturing overheads	2
Fixed manufacturing overheads	4
Selling and packing expense - variable	1
	17

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 expense from the external price since this expense is not incurred for internal transfers.

Division B incorporates the transferred-in goods into a more advanced product. The unit costs of this product are as follows:

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	(Rs.)
Transferred-in term (from Division A)	29
Direct material and components	23
Direct labour	3
Variable overheads	12
Fixed overheads	12
Selling and packing expense variable	1
	80

Division B's manager disagrees with the basis used to set the transfer price. He argues that the transfers should be made at variable cost plus an agreed (minimal) mark-up since he claims that his division is taking output that Division A would 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.20	Rs.30	Rs.40
Demand	15,000	10,000	5,000
Division B			
Selling price	Rs.80	Rs.90	100
Demand	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 profits.

You are required:

- (a) To calculate the effect that the transfer pricing system has had on the company's profits, and
- (b) To establish the likely effect on profit of adopting the suggestion by the manager of Division B of a transfer price of Rs.12.

Question: 13

Companies RP, RR, RS and RT are members of a group. RP wishes to buy an electronic control system for its factory and, in accordance with group policy, must obtain quotations from companies inside and outside of the group.

From outside of the group the following quotations are received:

Company A quoted Rs.33,200.

Company B quoted Rs.35,000 but would buy a special unit from RS for Rs.13,000. To make this unit, however, RS would need to buy parts from RR at a price of Rs.7,500. The inside quotation was from RS whose price was Rs.48,000. This would require RS buying parts from RR at a price of Rs.8,000 and units from RT at a price of Rs.30,000. However, RT would need to buy parts from RR at a price of Rs.11,000.

Additional data are as follows:

- (1) RR is extremely busy with work outside the group and has quoted current market prices for all its products.
- (2) RS costs for the RP contract, including purchases from RR and RT, total Rs.42,000. For the Company B contract it expects a profit of 25% on the cost of its own work.

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- (3) RT prices provide for a 20% profit margin on total costs.
- (4) The variable costs of the group companies in respect of the work under consideration are:
 RR: 20% of selling price.
 RS: 70% of own cost (excluding purchases from other group companies)
 RT: 65% of own cost (excluding purchases from other group companies) You are required, from a group point of view, to:
- (a) Recommend, with appropriate calculations, whether the contract should be placed with RS or Company A or Company B;
- (b) State briefly two assumptions you have made in arriving at your recommendations.

Question: 14

An industrial group of companies includes two divisions: A and B. the output of Division A is product A, two units of which are used by Division B for every one of its product B. Division B has first call on Division A's output but there is a separate market outside the group for the balance of Division A's output. All the output of Division B is sold outside the group.

The maximum capacity of Division A is 1,30,000 units of A and that of Division B is 50,000 units of B per annum. Each division maintains a stable level of stocks throughout the year.

The group would like to examine the results of using different bases of transfer pricing under different scenarios (ie situations that could be expected to arise).

The bases of transfer pricing are

Absorbed standard cost			AS	
Market price			MP	
Variable cost plus a lump sum of 80% of Division A's fixed cost			VC	
Scenario	Product A		Product B	
Number	Market price (per unit)	Total Demand (thousand units)	Market price (per unit)	Total Demand (thousand units)
		Rs.		Rs.
15	30	100	100	40
23	25	70	90	30
29	35	130	90	30
Costs per unit are:		Product A	Product B	
Variable cost		Rs.20	Rs.12	(Exclusive of 2 units of Product A)
Fixed cost		Rs.5	Rs.18	
Budgeted volume in units per annum		1,00,000	40,000	

Part 1

You are required to calculate the profits shown by Division A and by Division B for the following seven situations:

Scenario	Basis of Transfer pricing		
15	MP	VC	-
23	-	VC	AS
29	MP	VC	AS

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Part 2

Assume that Division B receives an overseas order for 20,000 units of B that will in no way influence its other clientele.

- (a) As manager of Division B state, with supporting calculations, whether you would recommend acceptance of the order in the following two situations:

Scenario	Price per unit (ex factory)	Basic of transfer pricing
(i) 23	Rs.55	AS
(ii) 29	Rs.65	MP

- (b) If you were Managing Director of the whole group state, with very brief reasons, whether you would recommend acceptance of the orders in (a) (i) and (a) (ii) above.

Question: 15

Vista Electronics manufactures two different types of coils used in electric motors. In the falls of the current year. Erica Becker, the controller, compiled the following data.

Sales forecast for 2000 (all units to be shipped in 2000):

Product	Units	Price
Light coil	60,000	Rs.65
Heavy coil	40,000	Rs. 95

Raw material prices and inventory levels:

Raw Material	Expected Inventories January 1, 2000	Desired Inventories December 31, 2000	Anticipated Purchase Price in Rs.
Sheet metal	32,000 lb.	36,000 lb.	8
Copper wire	29,000 lb	32,000 lb.	5
Platform	6,000 units	7,000 units	3

Use of raw material:

Raw Material	Amount Used per Unit	
	Light Coll	Heavy Coll
Sheet metal	4 lb	5 lb
Copper wire	2	3
Platform	-	1 unit

Direct-labor requirements and rates:

Product	Hours per Unit	Rate per Hour
Light coil	2	Rs.15
Heavy coil	3	20

Overhead is applied at the rate of Rs.2 per direct-labor hour.

Finished-goods inventories (in units):

Product	Expected January 1, 2000	Desired December 31, 2000
Light coil	20,000	25,000
Heavy coil	8,000	9,000

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Manufacturing overhead:

Overhead Cost Item	Activity-Based Budget Rate
Purchasing and material handling	Rs.25 per Rupee of sheet metal and cooper wire purchased.
Depreciation, utilities and inspection	Rs.4.00 per coil produced (either type) Shipping Rs.1.00 per coil shipped (either type)
General manufacturing overhead	Rs.3.00 per direct-labor hour

Required: Prepare the following budgets for 2000.

- 1) Sales budget (in Rupees).
- 2) Production budget (in units).
- 3) Raw-material purchases budget (in quantities).
- 4) Raw-material purchases budget (in Rupees).
- 5) Direct-labor budget (in Rupees).
- 6) Manufacturing overhead budget (in Rupees).

Question: 16

Toronto Business Associates, a division of Maple Leaf Services Corporation, offers management and computer consulting services to clients throughout Canada and the northeastern United states. The division specializes in website development and other Internet applications. The corporate management at Maple Leaf Services is pleased with the performance of Toronto Business Associates for the first nine months of the current year and has recommended that the division manager, Ramachandran, submit a revised forecast for the remaining quarter, as the division has exceeded the annual plan year-to-date by 20 percent of operating income. An unexpected increase in billed hour volume over the original plan is the main reason for this increase in income. The original operating budget for the first three quarters for Toronto Business Associates follows.

TORONTO BUSINESS ASSOCIATES 20x1 Operating Budget

	1st Quarter	2nd Quarter	3rd Quarter	Total for first three Quarters
Revenue:				
Consulting fees:				
Computer system consulting	4,21,875	4,21,875	4,21,875	12,65,625
Management consulting	3,15,000	3,15,000	3,15,000	9,45,000
Total consulting fees	7,36,875	7,36,875	7,36,875	22,10,625
Other revenue	10,000	10,000	10,000	30,000
Total revenue	7,46,875	7,46,875	7,46,875	22,40,625
Expenses:				
Consultant salary expenses	3,86,750	3,86,750	3,86,750	11,60,250
Travel and related expense	45,625	45,625	45,625	1,36,875
General and administrative expenses	1,00,000	1,00,000	1,00,000	3,00,000
Depreciation expense	40,000	40,000	40,000	1,20,000
Corporate expense allocation	50,000	50,000	50,000	1,50,000
Total expenses	6,22,375	6,22,375	6,22,375	18,67,125
Operating income	1,24,500	1,24,500	1,24,500	3,73,500

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Howell will reflect the following information in his revised forecast for the fourth quarter.

- Toronto Business Associates currently has 25 consultants on staff, 10 for management consulting and 15 for computer systems consulting. Three additional management consultants have been hired to start work at the beginning of the fourth quarter in order to meet the increased client demand.
- The hourly billing rate for consulting revenue will remain at 90 per hour for each management consultant and 75 per hour for each computer consultant. However, due to the favorable increase in billing hour volume when compared to the plan, the hours for each consultant will be increased by 50 hours per quarter.
- The budgeted annual salaries and actual annual salaries, paid monthly, are the same: 50,000 for a management consultant and 46,000 for a computer consultant. Corporate management has approved a merit increase of 10 percent at the beginning of the fourth quarter for all 25 existing consultants, while the new consultants will be compensated at the planned rate.
- The planned salary expense includes a provision for employee fringe benefits amounting to 30 percent of the annual salaries. However, the improvement of some corporate wide employee programs will increase the fringe benefits to 40 percent.
- The original plan assumes a fixed hourly rate for travel and other related expenses for each billing hour of consulting. These are expenses that are not reimbursed by the client, and the previously determined hourly rate has proven to be adequate to cover these costs.
- Other revenue is derived from temporary rentals and interest income and remains unchanged for the fourth quarter.
- General and administrative expenses have been favourable at 7 percent below the plan; this 7 percent savings on fourth quarter expenses will be reflected in the revised plan.
- Depreciation of office equipment and personal computers will stay constant at the projected straight-line rate.
- Due to the favourable experience for the first three quarters and the division's increased ability to absorb costs, the corporate management at Maple Leaf Services has increased the corporate expenses allocation by 50 percent.

Required:

- 1) Prepare a revised operating budget for the fourth quarter for Toronto Business Associates that Ramachandran will present to corporate management.
- 2) Discuss the reasons why an organization would prepare a revised operating budget.

Question: 17

Ford Ltd. manufactures and sells 15,000 units of a raft, RF17, in 2001. The full cost per unit is Rs.200. Ford earns a 20% return on an investment of Rs.18,00,000 in 2001.

Required:

- (1) Calculate the selling price of RF17 in 2001. Calculate the markup percentage on the full cost per unit of RF17 in 2001.
- (2) If the selling price in requirement 1 represents a markup percentage of 40% on variable costs per unit, calculate the variable cost per unit of RF17 in 2001.
- (3) Calculate Ford's operating income if it had increased the selling price to Rs.230. At this price Ford would have sold 13,500 units of RF17. Assume no change in total fixed costs. Should Ford have increased the selling price of RF17 to Rs.230?
- (4) In response to competitive pressure, Ford must reduce the price of RF17 to Rs.210 in 2002, in order to achieve sales of 15,000 units. Ford plans to reduce its investment to Rs.16,50,000. If Ford wants to maintain a 20% return on investment, what is the target cost per unit in 2002?

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Question: 18

Amrutha, president of PAL Electronics (PE), is concerned about the prospects of one of its major products. The president has been reviewing a marketing report with Krishna, marketing product manager, for their 10-disk car compact disk (CD) changer. The report indicates another price reduction is needed to meet anticipated competitors' reductions in sales prices. The current selling price for their 10-disk car CD changers is Rs.350 per unit. It is expected that within three months PE's two major competitors will be selling their 10-disk car CD changers for Rs.300 per unit. This concerns Amrutha because their current cost of producing the CD changers is Rs.315, which yields a Rs.35 profit on each unit sold.

The situation is especially disturbing because PE had implemented an activity-based costing (ABC) system about two years ago. The ABC system helped them better identify costs, cost pools, cost drivers, and cost reduction opportunities. Changes made when adopting ABC reduced costs on this product by approximately 15 percent during the last two years. Now it appears that costs will need to be reduced considerably more to remain competitive and to earn a profit on the 10-disk car CD changers. Total costs to produce, sell, and service the CD changer units are as follows:

10-Disk Car CD Changer		
		Per Unit
Material	Purchased components	Rs.110
	All other material	40
Labor	Manufacturing, direct	65
	Setups	9
	Materials handling	18
	Inspection	23
Machining	Cutting, shaping, and drilling	21
	Bending and finishing	14
Other	Finished-goods warehousing	5
	Warranty	10
	Total unit cost	Rs.315

Amrutha has decided to hire Damodar, a consultant, to help decide how to proceed. After two weeks of review, discussion, and value engineering analysis, Chandran suggested that PE adopt a just-in-time (JIT) cell manufacturing process to help reduce costs. He also suggested that using target costing would help in meeting the new target price.

By changing to a JIT cell manufacturing system, PE expects that manufacturing direct labor will increase by Rs.15 per finished unit. However, setup, material handling, inspection, and finished goods warehousing will all be eliminated. Machine costs will be reduced from Rs.35 to Rs.30 per unit, and warranty costs are expected to be reduced by 40 percent.

Required:

- (1) Determine PAL Electronics' unit target cost the Rs.300 competitive sales price while maintaining the same percentage of profit on sales as is earned on the current Rs.350 sales price.
- (2) If the just-in-time cell manufacturing process is implemented with the changes noted, will PAL Electronics meet the unit target cost you determined in requirement (3)? Prepare a schedule detailing cost reductions and the unit cost under the proposed JIT cell manufacturing process.

Question: 19

The management of Alliance Enterprises recently decided to adopt a just-in-time inventory policy to curb steadily rising costs and free up cash for purposes of investment. The company anticipates that inventory will decrease from Rs.36,00,000 to Rs.6,00,000, with the released funds to be invested at a 12 percent return for the firm. Additional data follow:

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- Reduced inventories should produce savings in insurance and property taxes of Rs.27,000.
- Alliance will lease 75 % of an existing warehouse to another firm for Rs.2 per square foot. The warehouse has 30,000 square feet.
- Because of the need to handle an increased number of small shipments from suppliers, Alliance will remodel production and receiving-dock facilities at a cost of Rs.6,00,000. The construction costs will be depreciated over a 10-year life.
- A shift in suppliers is expected to result in the purchase and use of more expensive raw materials. However, these materials should give rise to fewer warranty and repair problems after Alliance's finished product is sold, resulting in a net savings for the firm of Rs.25,000.
- Three employees who currently earn Rs.30,000 each will be directly affected by the just-in-time adoption decision. Two employees will be transferred to other positions with Alliance; one will be terminated.
- Reduced raw material inventory levels and accompanying stockouts will cost Alliance Rs.70,000.

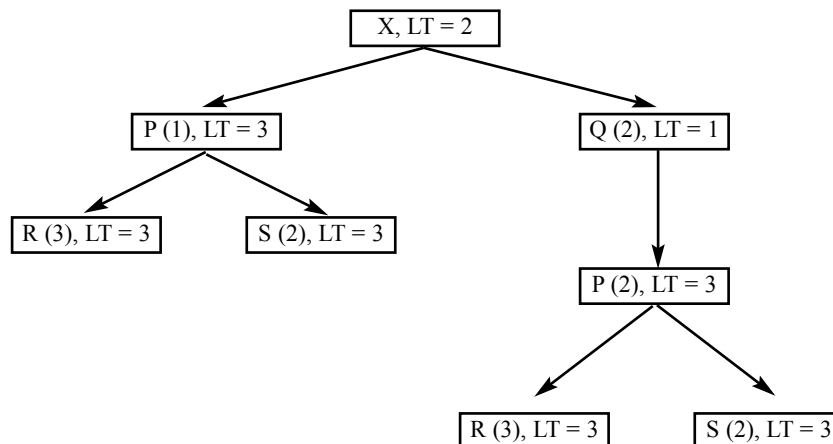
Required:

- (1) Compute the annual financial impact of Alliance's decision to adopt a just-in-time inventory system.
- (2) If the just-in-time system is implemented in proper fashion, what is the likelihood of excessive raw material stockouts? Briefly explain.
- (3) Adoption of a just-in-time purchasing system will often result in less need for the inspection of incoming materials and parts. Why?
- (4) In comparison with a traditional purchasing system, why does a just-in-time system give rise to an increased number of small shipments to the buying firm?

Question: 20

The product structure and the lead times for a finished product 'X' are given in figure below

If 100 units of X are required in week 12 and if none of the components, sub-assemblies and the end product are either on hand or on order, compute the amounts and dates of the planned order releases for all the components and sub-assemblies. Assume that there is no particular order size and therefore all the order quantities are lot for lot.



Question: 21

The lead time to procure Paracetamol from a supplier is four weeks. At present, 54 kg of the drug is available with us. There is also a scheduled receipt of 45 kg of it in four weeks. The production requirements of paracetamol over the next nine weeks are as:

Week	1	2	3	4	5	6	7	8	9
Amount in kg	24	-	29	11	-	5	19	27	18

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If we use an order quantity of 45 kg, when shall we release the orders for Paracetamol?

Question: 22

Having attended 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 given below for one period:

Product	A	B	C	D
Output in units	120	100	80	120
Costs per unit:	(Rs.)	(Rs.)	(Rs.)	(Rs.)
Direct 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 total of 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 despatch	4,620

You have ascertained that the 'cost drivers' to be used are as listed below for the overhead cost shown:

Cost	Cost Driver
Set up costs	Number of production runs
Stores receiving	Requisition raised
Inspection / Quality control	Number of production runs
Materials handling and despatch	Orders executed

The number of requisition raised on the stores was 20 for each product and the number of orders executed was 42, each orders being for a batch of 10 of a product. You are required.

- To calculate the total costs for each product if all overhead costs are absorbed on a machine hour basis;
- To calculate the total costs for each product, using activity-based costing;
- To calculate and list the unit product cost 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.

Question: 23

Sumantra Technology Ltd., manufactures several different types of printed circuit boards; however, two of the boards account for the majority of the company's sales. The first of these boards, a television circuit board, has been a standard in the industry for several years. The market for this type of board is competitive and price-sensitive. Sumantra plans to sell 65,000 of the TV boards in 2001 at a price of Rs.150 per unit. The second high-volume product, a personal computer circuit board, is a recent addition to Sumantra's product line. Because the PC board incorporates the latest technology it can be sold at a premium price. The 2001 plans include the sale of 40,000 PC boards at Rs.300 per unit.

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Sumantra's management group is meeting to discuss how to spend the sales and promotion Rupees for 2001. The sales manager believes that the market share for the TV board could be expanded by concentrating Sumantra's promotional efforts in this area. In response to this suggestion, the production manager said, "Why don't you go after a bigger market for the PC board? The cost sheets that I get show that the contribution from the PC board is more than double the contribution from the TV board. I know we get a premium price for the PC board. Selling it should help overall profitability."

The cost-accounting system shows that the following costs apply to the PC and TV boards.

	PC Board	TV Board
Direct material	Rs.140	Rs.80
Direct labour	4 hr.	1.5 hr.
Machine time	1.5 hr.	.5 hr.

Variable manufacturing overhead is applied on the basis of direct-labor hours. For 2001, variable overhead is budgeted at Rs.11,20,000, and direct-labor hours are estimated at 2,80,000. The hourly rates for machine time and direct labor are Rs.10 and Rs.14, respectively. The company applies a material-handling charge at 10 percent of material cost. This material-handling charge is not included in variable manufacturing overhead. Total 2001 expenditures for direct material are budgeted at Rs.1,06,00,000.

Andrew Fulton, Sumantra's controller, believes that before the management group proceeds with the discussion about allocating sales and promotional Rupees to individual products, it might be worth while to look at these products on the basis of the activities involved in their production. Fulton has prepared the following schedule to help the management group understand this concept.

"Using this information," Fulton explained, "we can calculate an activity-based cost for each TV board and each PC board and then compare it to the standard cost we have been using. The only cost that remains the same for both cost methods is the cost of direct material. The cost drivers will replace the direct labor, machine time, and overhead costs in the old standard cost figures."

Budgeted Cost	In Rs.	Cost Driver	Budgeted Annual Activity for Cost Driver
Procurement	4,00,000	Number of parts	40,00,000 parts
Production scheduling	2,20,000	Number of boards	1,10,000 boards
Packaging and shipping	4,40,000	Number of boards	1,10,000 boards
Total	10,60,000		
Machine setup	4,46,000	Number of setups	2,78,750 setups
Hazardous waste disposal	48,000	Rupees of waste	16,000 Rupees
Quality control	5,60,000	Number of inspections	1,60,000 inspections
General supplies	66,000	Number of boards	1,10,000 boards
Total	11,20,000		
Machine insertion	12,00,000	Number of insertions	30,00,000 insertions
Manual insertion	40,00,000	Numbers of insertions	10,00,000 insertions
Wave-soldering	1,32,000	Number of boards	1,10,000 boards
Total	53,32,000		

Required per Unit	PC Board	TV Board
Parts:	55	25
Machine insertions	35	24
Manual insertions	20	1
Machine setups	3	2
Hazardous waste disposal	.35 lb.	.02 lb.
Inspections	2	1

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Required:

- (1) Identify at least four general advantages associated with activity-based costing.
- (2) On the basis of Sumantra's unit cost data given in the problem, calculate the total contribution margin expected in 2001 for the PC board and the TV board.
- (3) On the basis of an activity-based costing system, calculate the total contribution margin expected in 2001 for the PC board and the TV board.
- (4) Explain how a comparison of the results of the two costing methods may impact the decisions made by Sumantra's management group.

Question: 24

Calton Ltd. make and sell a single product. The existing product unit specifications are as follows:

Direct material X:	8 sq. metres at Rs.4 per sq. metre
Machine time:	0.6 running hours
Machine cost per gross hour:	Rs.40
Selling price:	Rs.100

Calton Ltd., require to fulfil orders for 5,000 product units per period. There are no stocks of product units at the beginning or end of the period under review. The stock level of material X remains unchanged throughout the period.

The following additional information affects the costs and revenues:

- (1) 5% of incoming material from suppliers is scrapped due to poor receipt and storage organisation.
- (2) 4% of material X input to the machine process is wasted due to processing problems.
- (3) Inspection and storage of material X costs Rs.0.10 pence per sq. metre purchased.
- (4) Inspection during the production cycle, calibration checks on inspection equipment, vendor rating and other checks costs Rs.25,000 per period
- (5) Production quantity is increased to allow for the downgrading of 12.5% of product units at the final inspection stage. Downgraded units are sold as 'second quality' units at a discount of 30% on the standard selling price.
- (6) Production quantity is increased to allow for returns from customers which are replaced free of charge. Returns are due to specification failure and account for 5% of units initially delivered to customers. Replacement units incur a delivery cost of Rs.8 per unit. 80% of the returns from customers are rectified using 0.2 hours of machine running time per unit and are re-sold as 'third quality' products at a discount of 50% on the standard selling price. The remaining returned units are sold as scrap for Rs.5 per unit.
- (7) Product liability and other claims by customers is estimated at 3% of sales revenue from standard product sales.
- (8) Machine idle time is 20% of gross machine hours used (i.e. running hours = 80% of gross hours).
- (9) Sundry costs of administration, selling and distribution total Rs.60,000 per period.
- (10) Calton Ltd is aware of the problem of excess costs and currently spends Rs.20,000 per period in efforts to prevent a number of such problems from occurring.

Calton Ltd. is planning a quality management programme which will increase its excess cost prevention expenditure from Rs.20,000 to Rs.60,000 per period. It is estimated that this will have the following impact.

- (1) A reduction in stores losses of material X to 3% of incoming material.
- (2) A reduction in the downgrading of product units at inspection to 7.5% of units inspected.
- (3) A reduction in material X losses in process to 2.5% of input to the machine process.

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- (4) A reduction in returns of products from customers to 2.5% of units delivered.
- (5) A reduction in machine idle time to 12.5% of gross hours used.
- (6) A reduction in product liability and other claims to 1% of sales revenue from standard product sales.
- (7) A reduction in inspection, calibration, vendor rating and other checks by 40% of the existing figure.
- (8) A reduction in sundry administration, selling and distribution costs by 10% of the existing figure.
- (9) A reduction in machine running time required per product unit to 0.5 hours.

Required:

- (a) Prepare summaries showing the calculation of (i) total production units (pre-inspection), (ii) purchases of material X (sq. metres), (iii) gross machine hours. In each case the figures are required for the situation both before and after the implementation of the additional quality management programme, in order that the orders for 5,000 product units may be fulfilled.
- (b) Prepare profit and loss account for Calton Ltd for the period showing the profit earned both before and after the implementation of the additional quality management programme.
- (c) Comment on the relevance of a quality management programme and explain the meaning of the terms internal failure costs, external failure costs, appraisal costs and prevention costs giving examples for each, taken where possible from the information in the question.

Question: 25

Destiny Products makes digital watches. Destiny is preparing a product life-cycle budget for a new watch, MX3. Development on the new watch is to start shortly. Estimates about MX3 are as follows:

Life-cycle units manufactured and sold	4,00,000
Selling price per watch	Rs.40
Life-cycle costs	
R & D and design costs	Rs.10,00,000
Manufacturing	
Variable costs per watch	Rs.15
Variable costs per batch	Rs.600
Watches per batch	500
Fixed costs	Rs.18,00,000
Marketing	
Variable costs per watch	Rs.3.20
Fixed costs	Rs.10,00,000
Distribution	
Variable costs per batch	Rs.280
Watches per batch	160
Fixed costs	Rs.7,20,000
Customer-service costs per watch	Rs.1.50

Ignore the time value of money.

Required:

- (1) Calculate the budgeted life-cycle operating income for the new watch.
- (2) What percentage of the budgeted total product life-cycle costs will be incurred by the end of the R & D and design stages?

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- (3) An analysis reveals that 80% of the budgeted total product life-cycle costs of the new watch will be locked in at the end of the R & D and design stages. What implications does this finding have for managing MX3's costs?
- (4) Destiny's Market Research Department estimates that reducing MX3's price by Rs.3 will increase life-cycle unit sales by 10 percent. If unit sales increase by 10%, Destiny plans to increase manufacturing and distribution batch sizes by 10% as well. Assume that all variable costs per watch, variable costs per batch, and fixed costs will remain the same. Should Destiny reduce MX3's price by Rs.3? Show your calculations.

Question: 26

A first batch of 25 transistor radios took a total of 250 direct labour hours. It is proposed to assemble another 40 units. What will be the average labour per unit in this lot? Assume that there is 85% learning rate.

Question: 27

Bhakatavatsala & Co, a fire arms manufacturer, has designed a new type of gun and a first lot of 25 guns assembled for test purposes had the following costs:

Direct materials	24,500	
Direct labour	22,500	
Variable overheads	16,875	Proportional to direct labour
Fixed overheads	11,250	
Total costs	75,125	

BSF being satisfied with this gun have asked the lowest bid for supply of 1,000 guns. The company will pass on the benefits of learning of 85% to the client in setting the bid. The company will set a selling price to earn 40% gross profit margin. Determine the unit price that should be bid.

Question: 28

One unit of product A contributes Rs.7 and requires 3 units of raw material and 2 hours of labour. One unit of product B contributes Rs.5 and requires one unit of raw material and one hour of labour. Availability of the raw material at present is 48 units and there are 40 hours of labour.

- Formulate it as a linear programming problem.
- Write its dual.
- Solve the dual with Simplex method and find the optimal product mix and shadow prices of the raw material and labour.

Question: 29

The simplex tableau for a maximization problem of linear programming is given here:

Product Mix						
C _j	x _j	X ₁	x ₂	S ₁	S ₂	Quantity (b _i)
5	x ₂	1	1	1	0	10
0	S ₂	1	0	-1	1	3
	c _j	4	5	0	0	
	z _j	5	5	5	0	
	c _j - z _j	-1	0	-5	0	

Answer the following questions, giving reasons in brief:

- Is this solution optimal?
- Are there more than one optimal solution?
- Is this solution degenerate?

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- (d) Is this solution feasible?
- (e) If S1 is slack in machine A (in hours / week and S2 is slack in machine B (in hours / week), which of these machines is being used to the full capacity when producing according to this solution?
- (f) A customer would like to have one unit of product x1 and is willing to pay in excess of the normal price in order to get it. How much should the price be increased in order to ensure no reduction of profits?

Question: 30

Management of Ranga Ltd are very much worried about the continuing recession in the country. The company has 7 divisions (A to G). they have decided to close four divisions namely A,B,C and D and transfer some of the employees to the remaining divisions. Personnel at the units to be closed have signified a willingness to move to any of the three remaining units and the company is willing to provide them with removal costs. The technology of production is different to some degree at each unit and retraining expenses will be incurred on transfer. Not all existing personnel can be absorbed by transfer and a number of redundancies will arise. Cost of redundancy is given as a general figure at each unit is to be closed.

Number employed A-200 B-400 C-300 D-200

Rs. thousands per person				
Retraining costs	A	B	C	D
Transfer to :				
Unit E	0.5	0.4	0.6	1.3
Unit F	0.6	0.4	0.6	0.3
Unit G	0.5	0.3	0.7	0.3
Removal costs:				
Transfer to :				
Unit E	2.5	3.6	3.4	3.7
Unit F	2.4	4.6	3.4	1.7
Unit G	2.5	2.7	3.3	2.7
Redundancy payments	6.0	5.0	6.0	7.0

Additional personnel required at units remaining open: E-350 F-450 G-200.

To use the transportation method to obtain an optimal solution to the problem of the cheapest means to transfer personnel from the units to be closed to those which will be expanded.

Question: 31

A management consulting firm has a backlog of 4 contracts. Work on these contracts must be started immediately. 3 project leaders are available for assignment to the contracts. Because of the varying work experience of the leaders, the profit to consulting firm will vary based on the assignment as shown below. The unassigned contract can be completed by subcontracting the work to an outside consultant. The profit on the subcontract is zero. Finds the optimal assignment.

Project Leader	Contract			
	1	2	3	4
A	13	10	9	11
B	15	17	13	20
C	6	8	11	7

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Question: 32

The tit-fit Scientific Laboratories is engaged in producing different types of High-class equipments for use in Science labs. The company has two different assembly lines to produce its popular product "P".

Processing time (minutes)	10	11	12	13	14
Assembly A1	0.10	0.15	0.40	0.25	0.10
Assembly A2	0.20	0.40	0.20	0.15	0.05

Use the following Random(Rn.) no's, generate data on the process times for 15 units of the item and complete the expected process time for the product.

4134	8343	3602	7505	7428
7476	1183	9445	0089	3424
4943	1915	5415	0880	9309

Question: 33

A project consists of 7 activities. The time for performance of each of the activity is as follows:-

Activity	Immediate	Time	Probability
A	-	3	0.2
		4	0.6
		5	0.2
B	-	4	0.1
		4	0.3
		4	0.3
		4	0.2
		4	0.1
C	A	1	0.15
		1	0.75
		1	0.10
D	B,C	4	0.8
		5	0.2
E	D	3	0.1
		4	0.3
		5	0.3
		6	0.3
F	D	5	0.20
		7	0.80
G	E,F	2	0.5
		3	0.5

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- a) Draw a network and identify critical path using expected time.
 b) Simulate the project for 5 times using Rn.no's and find critical paths?

68	13	09	20	73	07	72
99	93	18	24	22	07	29
57	33	49	65	92	98	00
57	12	31	96	85	92	91
77	37	34	11	27	10	59

Question: 34

A small maintenance project consist of jobs in the table below. With each job is listed its normal time and a minimum or crash time in days. The cost in Rs. Per day of each job is also given:

Job(i-j)	Normal days	Crash days	Cost/Day
1-2	9	6	40
1-3	8	5	50
1-4	15	10	60
2-4	5	3	20
3-4	10	6	30
4-5	2	1	80

- a) What is the normal project length and minimum project length?
 b) Determine the minimum crashing cost of schedules ranging from normal length down to, and including, the minimum length schedule.
 c) Overhead costs total Rs.115/day. What is the optimum length schedule in terms of both crashing and overhead cost?

Question: 35

Allocate the men efficiently to the jobs given below and Find out the time required to complete the project. No. of persons: 4

Job (I-j)	tn	Men
1-2	10	1
1-3	6	2
1-5	5	3
2-3	0	0
2-6	8	1
3-4	10	2
4-7	10	3
5-6	7	1
6-7	5	2



COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Answer to Question No.1:

Elimination of decorative stitching cost.

Cost	Benefit
Loss of contribution due to fall in sales (WN-1) 1,35,000	Reduction in production cost $2,70,000 \times 0.6 = 1,62,000/-$
Net benefit = 27,000/-	

(a) Substituting glass eyes by plastic eyes.

Cost of Glass eyes =	$2,70,000 \times 2 \times 100/95 \times 20/100 =$	1,13,684/-
Cost of Plastic eyes=	$2,70,000 \times 2 \times 100/95 \times 15/100 =$	90,000/-
	Saving in cost	23,684/-

(b) Change the filling material:

Cost of synthetic material =	$2,70,000 \times 80/2000 =$	10,800
Cost of Scrap fabric =	$2,70,000 \times 0.05 =$	13,500
	Additional Cost	2,700

Net effect on the profit (increase) = $(27,000 + 23,684 - 2,700) = 47,984/-$

➡ Effect of implementation of 3 proposals on unit contribution = $4.5 + 0.6 + (23,684 - 2,700) / 2,70,000 = 5.177/-$

Sales necessary to earn contribution of Rs.13,50,000 = $13,50,000 / 5.177 = 2,60,769$

Percentage of decrease in sales that can be tolerated = $(3,00,000 - 2,60,769 / 3,00,000) \times 100 = 13.08\%$

Working note 1

(i)	Net Profit =	$3,00,000 \times 3 =$	9,00,000
(ii)	Fixed cost =		4,50,000
(iii)	Total contribution =		13,50,000
(iv)	Units =		3,00,000
(v)	Unit contribution =		4.5/-
(vi)	Decrease in sales =	$3,00,000 \times 10\% =$	30,000 units
(vii)	Contribution lost =	$30,000 \times 4.5 =$	1,35,000/-

Answer to Question No. 2

	Increase Production by 50%			Increase Production by 75%		
	Purchase A - Outside	Purchase B - Outside	Purchase C - Outside	Purchase A - Outside	Purchase B - Outside	Purchase C - Outside
1) Hours released	10	16	20	10	16	20
2) Hours for other components	36	30	26	36	30	26
3) Capacity increase possible	$(10/36) \times 100 = 27.78\%$	$(16/30) \times 100 = 53.33\%$ restricted to 50%	$(20/26) \times 100 = 76.92\%$ restricted to 50%	27.78%	53.33%	76.92% restricted to 75%

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4) Additional contribution (Same cost is assumed incremental cost considered separately)	30 (108 x 27.78%)	54 (108 x 50%)	54 (108 x 50%)	30	57.60 (108 x 53.33%)	81 (108 x 75%)
5) Incremental Cost	(36-26) x 127.78% = 12.78%	(46-32) x 150% = 21	(54-32) x 150% = 33	12.78	(46-32) x 153.33% = 21.46	(54-32) x 175% = 38.5
6) Net benefit	17.22 (III)	33 (I)	21 (II)	17.22 (III)	36.13 (II)	42.5 (I)
7) Strategy	Make	Buy	Make	Make	Make	Buy

Answer to Question No. 3

(i) Local market

Production = 50,000 units (p.a.)

SP = 7.5/-

Unrelated market

SP = 5.5/-

➡ Total net profit requirement = 3,000

variable cost (P.U.) = 2,80,000/70,000 = 4/-

Profit / Loss from current				
production	=	50,000 x (7.5 - 4) - 1,90,000	=	(15,000/-)
Increase in profit necessary (to reach a total profit = 3,000)	=	15,000 + 3,000	=	18,000
Unit contribution (from unrelated market)	=	5.5 - 4	=	1.5/- (P.U)
No. of additional required units	=	18,000 / 1.5	=	12,000 units

Note:

Total units = 50,000 + 12,000 = 62,000

Since 62,000 < 65,000 (II range - max), there will be no additional units to be sold.

(ii) SP = 7.5/-

Current production = 60,000 units p.a.

Additional production requirement = 20,000 units

Net profit = 5% on (80,000 x 7.5) = 30,000/-

Sales	6,00,000
VC (80,000 x 4)	3,20,000
Contribution	2,80,000
Profit	30,000
Fixed Cost (Estimated)	2,50,000
Actual Fixed Cost	2,10,000
Sales promotion (Balancing Figure)	40,000

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(iii) NP Currently 10,000 /-

FC 1,60,000 /-

2% increase in SP è increase in profits 5,000.

Current sales = $5,000 / 0.02 = 2,50,000/-$

	Current	After 2% increase
Sales	X	(x * 1.02)
(-) VC		
	1,70,000	1,75,000
(-) FC	1,60,000	1,60,000
	10,000	5,000

$$X - VC = 1,70,000$$

$$1.2x - VC = 1,75,000$$

Solving these 2 equations x = 2,50,000/-

Variable cost = $2,50,000 - 1,70,000 = 80,000/-$

Unit variable cost = $2,80,000 / 70,000 = 4$

Sales units = $80,000 / 4 = 20,000$ units

Answer to Question No. 4

(i)

Particulars	A	B	C
(1) SP (per 1,000 LL)	100	220	450
(2) VC (per 1,000 LL)	40	70	130
(3) Contribution (per 1,000LL) (1-2)	60	150	320
(4) Specific FC	2,400	4,000	9,500
Add General Fixed Cost	4,000	4,000	4,000
Assuming A or B or C the only product	6,400	8,000	13,500
(5) BEP (in 1,000s) (Assuming - A, B, or C as the only product) $(4 \div 3)$	106.66	53.33	42.1875
(6) Maximum output possible	60	60	60
(7) BEP - achievable at peak	No (106.66 > 60)	Yes	Yes
(8) Conclusion	A - Cannot be a stand alone Product	Can be a stand alone Product	Can be a stand alone product
(9) BEP (if it is performed with other products) (in 000s)	$2,400/60 = 40$	$4,000/150 = 26.66$	$9,500/320 = 29.6875$
(10) Minimum output necessary	30	30	30
(11) Conclusion	Takeup only if the minimum order is 40 and not as a stand alone product	Can be taken up as a stand alone and as well as jointly	Can be taken up as a stand alone as well as jointly

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(ii)

Product	(000's)	Contribution	Total	SP FC	Profit
A	50	60	3,000	2,400	600
B	50	150	7,500	4,000	3,500
C	35	320	11,200	9,500	1,700

Contribution to General FC	5,800
General FC	4,000
Profit	1,800

(iii)

Packs of special paper required

	Units	Required	Total required
A	10	2	20
B	10	6	60
C	10	16	160
Total required			240 Packs

Availability = 170 Packs

Availability < required (Packs are the Limiting Factor)

Contribution	Packed required	Contribution/pack	Rank
A 60	20	30	I
B 150	6	25	II
C 320	16	20	III

Allocation - I

Upon allocation of remaining 90 packs only 5625 nos of C can be printed. But this will violate the basic condition of printing to be made in multiples of 1000 nos. So, only 5000 nos can be printed. This would leave 10 packs not utilized at all. $(90 - 5 \times 16)$. This is a problem on limiting factor involving the best utilization of limited resource of 170 packs. It should not result in 10 packs unutilized. One should find better combination of printing the final product ensuring the fullest utilization of all 170 packs. In the process of reallocation some give and take adjustment shall be carried out between the last ranked product C and second ranked product B. Why such adjustment between second and last ranked product should be made?

The amount of sacrifice between 2nd ranked product and the last ranked product shall be minimal. If the sacrifice were to be between first ranked and the last ranked then the sacrifice per pack will be as maximum of Rs.10 $(30 - 20)$. The sacrifice between the second ranked and the last ranked product shall only be Rs.5 $(25 - 20)$. One (000s) units of B upon sacrificed will result in 6 packs released in favour of C. The released 6 packs and the remaining 10 will make out one (000s) units of C and thereby the entire 170 units shall be fully utilized. It is to be seen whether this combination would show a better profit than the profit when 10 packs went unutilized.

Before adjustment After adjustment

Products	Contribution/ Pack	No of packs	Contribution	No of packs	Contribution
A	30	$10 \times 2 = 20$	600	$10 \times 2 = 20$	600
B	25	$10 \times 6 = 60$	1500	$9 \times 6 = 54$	1350
C	20	$5 \times 16 = 80$	1600	$6 \times 16 = 96$	1920
		160	3700	170	3870

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It is very clear that such an adjustment between B and C had resulted in a better profit and the scarce resources are fully utilized.

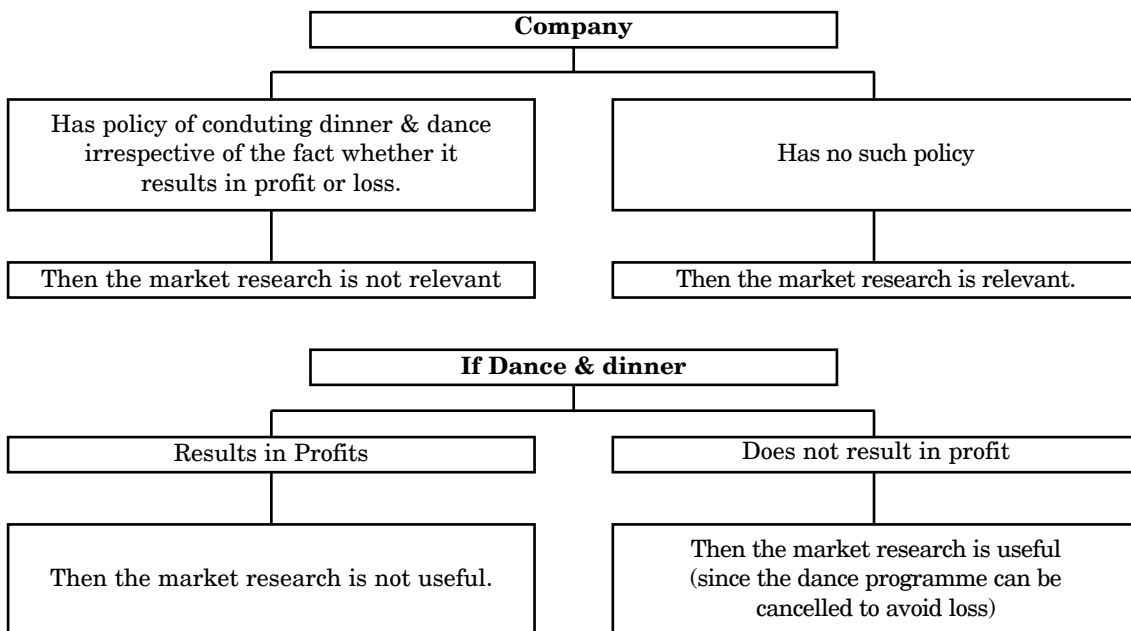
Answer to Question No. 5

Computation of expected value of profit to be earned from the dinner & dance:

Tickets	Revenue (Tickets) @ 20	Revenue (Raffle) @ Rs. 5	Revenue (Photo) @ Re. 1	Total Revenue	Hire	Band & entertainment	Raffle Prizes	Photo	Food @ Rs. 12 Mini. 400 Nos.	Total Cost	Net Profit	Profitability	Expected loss/profit
300	6,000	1,500	300	7,800	700	2,800	800	200	4,800	9,300	(1,500)	0.2	(300)
400	8,000	2,000	400	10,400	700	2,800	800	200	4,800	9,300	1,100	0.3	330
500	10,000	2,500	500	13,000	700	2,800	800	200	6,000	10,500	2,500	0.4	1,000
600	12,000	3,000	600	15,600	700	2,800	800	200	7,200	11,700	3,900	0.1	390
													1,420

Programme advertising							
No. of Pages	Revenue @ Rs. 70	Fixed Cost	Variable @ Rs. 5 Cost	Total Cost	Net Revenue	Prob.	Profit/Loss
24	1,680	2,000	120	2,120	(440)	0.2	(88)
32	2,240	2,000	160	2,160	80	0.4	32
40	2,800	2,000	200	2,200	600	0.3	180
48	3,360	2,000	240	2,240	1,120	0.1	112
				Expected profit			236

Total expected profits = 1,420 + 236 = 1,656.



Note: The institution incurs loss only when it sells 300 tickets.

Expected loss from sale of 300 tickets.

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Dance & Dinner	Program Advt.	Net Profit	Joint Probability	Expected Value
(1,500)	(440)	(1,940)	$0.2 \times 0.2 = 0.04$	(77.6)
(1,500)	80	(1,420)	$0.2 \times 0.4 = 0.08$	(113.6)
(1,500)	600	(900)	$0.2 \times 0.3 = 0.06$	(54)
(1,500)	1120	(380)	$0.2 \times 0.1 = 0.02$	(7.6)
Expected value of loss avoided (This is the benefit from market research)				(252.8)

Since cost > benefit - the market research is not justified.

Working notes on Probability - Tickets			
Tickets sold	Nos	Mean	Probability
250 to 349	4	300	$4/20 = 0.2$
350 to 449	6	400	$6/20 = 0.3$
450 to 549	8	500	$8/20 = 0.4$
550 to 649	2	600	$2/20 = 0.1$
	20		1.0

Working notes on Probability - Programme		
No of Programmes	Nos	Probability
24	4	$4/20 = 0.2$
32	8	$8/20 = 0.4$
40	6	$6/20 = 0.3$
48	2	$2/20 = 0.1$
	20	1.0

Answer to Question No. 6

	Actual Production	Output per Standard hour	Standard hours Produced
Cups	4260	30	142
Saucers	6400	40	160
Plates	3950	25	158
Total standard hours produced (for actual production)			460

Standard hours for budgeted production

Items	Budgeted production	Output per per standard hour	Standard hours produced
Cups	4500	30	150
Saucers	4000	40	100
Plates	6250	25	250
Standard hours required for Budgeted production			500

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i) Ratio for the productivity of the direct operatives =	Standard hour equivalent of actual production Actual hours worked = $460/400 \times 100 = 115\%$
ii) Ratio appropriate expressing the depts. Actual production relative to that budgeted	= Standard hour equivalent of actual Production
	Standard hour equivalent of budgeted production = $460/500 = 92\%$
iii) Capacity utilisation ratio =	Actual hours worked Std. hours equivalent to budgeted production = $400/500 = 80\%$

Answer to Question No. 7

Directly not attributable to department-B

- a. Price variance relating to material transferred from department - A
 $= 9 \times 1400 - 21000$
 $= 8400 \text{ A}$
- b. Allocated fixed overhead expenditure variance
- | | | |
|--------------------|---|--------------|
| Budgeted (400 x 8) | = | 3200 |
| Actual | = | <u>2900</u> |
| | | <u>300 F</u> |

Directly attributable to department-B

- a) Usage variance relating to materials transferred from department - A
 $= 9 \times 500 \times 3 - 9 \times 1400$
 $= 900 \text{ F}$
- b) Allocated fixed overhead volume variance
 $= 500 \times 8 - 3200 = 800 \text{ F}$
- c) Variance relating to material consumed in Department B

SP X SQ	AP X AQ	SP X AQ
$5 \times 500 \times 4 = 10000$	$6.05 \times 1900 = 11500$	$5 \times 1900 = 9500$

$$\text{MPV} = 3 - 2 = 9500 - 11500 = 2000 \text{ A}$$

$$\text{MUV} = 1 - 3 = 10000 - 9500 = \underline{500 \text{ F}}$$

$$\text{MCV} = \underline{1500 \text{ A}}$$

- d) Direct labour variance

SRX SH	ARX AH	SRX AH
$2 \times 500 \times 14 = 14000$	14000 (given)	$2 \times 6500 = 13000$

$$\text{DLRV} = 3 - 2 = 13000 - 14000 = 1000 \text{ A}$$

$$\text{DLEV} = 1 - 3 = 14000 - 13000 = \underline{1000 \text{ F}}$$

$$\text{DLCV} = \underline{0}$$

- e) Variable overhead variance

AQ x SR	AVO	AH x SR
$500 \times 14 = 7000$	8000	$6500 \times 1 = 6500$

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$$\begin{aligned}\text{VOEV} &= 3 - 2 = 6500 - 8000 = 1500 \text{ A} \\ \text{VO Eff.V} &= 1 - 3 = 7000 - 6500 = \underline{500 \text{ F}} \\ &= \underline{1000 \text{ A}}\end{aligned}$$

f) Fixed overhead variance

AO X SR	AFO	BFO	AH X SR
$500 \times 3 = 1500$	1600	$1200 (400 \times 3)$	$6500 \times (3/14) = 1393$

$$\text{FOEV} = 3 - 2 = 1200 - 1600 = 400 \text{ A}$$

$$\begin{aligned}\text{FOVV} &= 1 - 3 = 1500 - 1200 = \underline{300 \text{ F}} \\ &= \underline{100 \text{ A}}\end{aligned}$$

Summary

- ➡ Non-attributable variances = 8100 A
(8400 A - 300 F)
- ➡ Attributable variances
(900 + 800 - 1500 - 1000 - 100) = 900 A
- ➡ Total variances = 9000 A

NOTE It is assumed that department - B has control over all items except the material transferred and allocated fixed overheads

Answer to Question No. 8

(i) Computation of sales margin variances

(1)	(2)	(3)
BQ x BM	AQ x AM	AQ x BM
$10,000 \times 1 = 10,000$	$7,000 \times 4 = 28,000$	$7,000 \times 1 = 7,000$

- ➡ Sales margin volume variance = $1 - 3 = 3,000 \text{ A}$
- ➡ Sales margin price variance = $3 - 2 = 21,000 \text{ F}$
- ➡ Total sales margin variance = $1 - 2 = 18,000 \text{ F}$

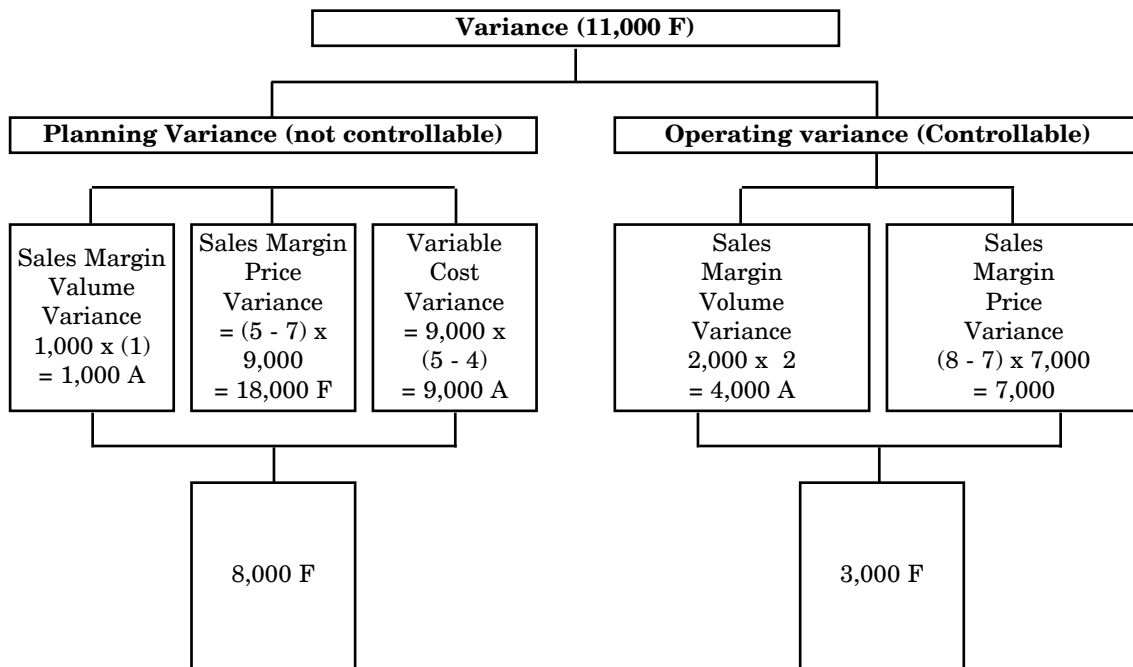
Note:

Budgeted contribution ($10,000 \times 1$) =	10,000
Add: Favourable Sales Margin variance	18,000
	28,000
Less: Adverse variable cost variance ($4-5$) x 7,000	(7,000)
Actual contribution	21,000

(ii)

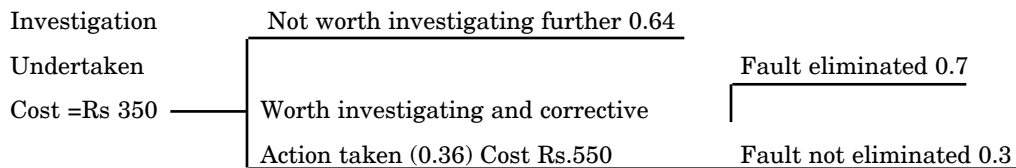
	Units	SP	VC	C	Total contribution
Original ex-ante	10,000	5	4	1	10,000
Ex-post ($45,000 \times 20\%$)	9,000	7	5	2	18,000
Actual	7,000	8	5	3	21,000

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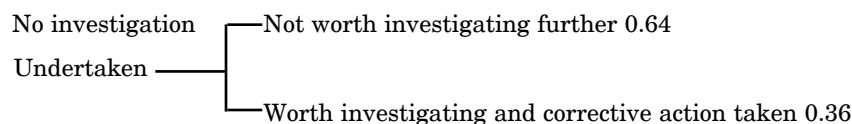
Answer to Question No. 9

a) (i) Decision Tree if an investigation is carried out



Expected cost = $350 + (0.36 \times 550) + (0.36 \times 0.3 \times 525 \times (4.7135)) = \text{Rs.815}$

(ii) (a) Decision tree if an investigation is not carried out



Expected cost = $0.36 \times 525 \times 4.7135 = 891$

b) investigate the variances (based on the criterion of expected cost)

c) **Not worth investigating** **Worth investigating**

i) Variance is due to random uncontrollable factors	i) excessive usages of labour and material due to wrong working practices on a repetitive operations which is likely continue if not corrected.
ii) Where the cause is obvious and future action has been taken to remedy the situation	ii) Where the variance is significant and exceeds standard limits.

d) Indifference point 'X' = variance

$$350 + (0.36 \times 550) + (0.36 \times 0.3 \times 4.7135x) \text{ [expected cost of investigation]} = 0.36 \times 4.7135x \text{ [Expected cost of no investigation]}$$

$$x = 461$$

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Answer to Question No. 10

(a)

(i) Ascertainment of tender price for school extension contract using normal pricing method.

Tender price = Direct cost + 100% of direct cost

Direct cost = Direct material + Direct labour.

Direct material			
Z (100 x 7 + 1000 x 10)	=	10,700	
Y (150 x 40)	=	6,000	
X (300 x 35 + 300 x 33)	=	20,400	
W (200 x 20)	=	4,000	41,100
Direct labour			
Craftsmen (2 x 16,000 x 6/12)	=	16,000	
Bonus (2 x 700)	=	1,400	
Casual labour (4,000 x 3)	=	12,000	29,400
Total direct cost			70,500

Tender price = 70,500 + 70,500 = 1,41,000/-

(ii) Ascertainment of Break-even tender price using relevant cost approach.

Direct Materials.			Rs.
Z (1,100 x 10)	=	11,000	
Y (150 x 44)	=	6,600	
X (300 x 33 + 300 x 25)	=	17,400	
W (200 x 16)	=	3,200	38,200
Direct labour			
Craftsmen		11,800	
Bonus (700 x 2)		1,400	
Casual Labour (4,000 x 3)		12,000	25,200
General purpose equipment (16,400 - 12,600)			
			3,800
Special purpose equipment (9,000 - 5,800)			3,200
Administrative expenses			5,000
Total cost			75,400

Note:

- (1) Salary paid to craftsmen is not relevant since they are going to be retained anyway.
- (2) Temporary workers are hired only because the craftsmen are used in the contract. Therefore the wages to temporary workers should be included in computation of the project cost.
- (3) Anyway general purpose equipment is going to be retained. Therefore the relevant cost is the fall in the realisable value after 6 months (due to usage).
- (4) Special purpose equipment is to be purchased second hand and it could be sold after the end of the project the relevant cost is (9,000 - 5,800) = 3,200/-
- (5) The company had already entered into lease agreement. Therefore there is not going to be any additional commitment due to this project.

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(b) Expected profit from project-B.

Expected Revenue = (1,00,000 x 0.7 + 1,20,000 x 0.3)	=	(1,06,000)
Less: Building cost (60,000 x 0.4 + 80,000 x 0.4 + 95,000 x 0.2)	=	75,000
Less: Land cost	=	20,000
Expected profit		11,000

When school extension contract is accepted, we will be losing the profit from project-B.

Therefore It is the opportunity cost.

Relevant cost of school extension profit = 86,400 (75,400 + 11,000)

Answer to Question No. 11

(a) Ascertainment of Processing time available:-

Products	Units	Req. (hrs)	Total Available
X	15,000	1.00	15,000
Y	30,000	0.5	15,000
			30,000

Ascertainment of hours reqd.

Products	Units	Req. (Grs.)	Total req. (grs)
X	20,000	1	20,000
Y	40,000	0.5	20,000
			40,000

Availability < Requirement. Therefore the processing time is the limiting factor.

Particulars	X	Y	
(1) Unit costs	12	24	
(2) Fixed OH	60,000	3,00,000	
(3) Units	15,000	30,000	
(4) FOH (P.U)	4	10	
(5) VC (P.U)	8	14	
(6) SP (P.U)	16	32	
(7) Contribution (P.U.)	8	18	
(8) Hours (P.U)	1	0.5	
(9) Contribution (Per Hour)	8	36	
(10) Rank	II	I	
(11) Allocation of hours	10,000 hrs (balancing figure)	40,000 x 0.5 = 20,000 hrs	Total 30,000 hrs.
(12) Contribution (11 x 9)	80,000	7,20,000	8,00,000.

(b) Product - X

SP = 21 - 0.00025x (where 'x' is the demand for Product X; SP = Selling Price)

TR = 21x - 0.00025x² (TR = Total Revenue)

MR = dTR/dx = 21 - 0.0005x (MR = Marginal revenue)

MC = Rs.8

Optimum output level is the output level at which MR = MC

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$$21 - 0.0005x = 8$$

$$x = 26,000 \text{ units (optimum output level)}$$

$$SP = 21 - (26,000 \times 0.00025) = 14.5 \text{ (Optimum selling price)}$$

Product - Y

$$SP = 38 - 0.00015x \text{ (where 'x' is the demand for product - Y & SP = Selling Price)}$$

$$TR = 38x - 0.00015x^2$$

$$MR = dTR/dx = 38 - 0.0003x$$

$$MC = \text{Rs. } 14.$$

$$38 - 0.0003x = 14;$$

$$\text{optimum output level} = x = 80,000 \text{ units}$$

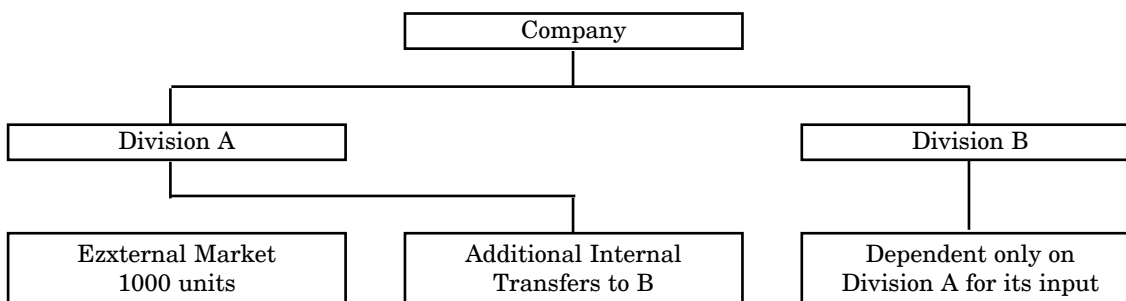
$$SP = \text{Optimum selling price} = 38 - (0.00015 \times 80,000) = 26/-$$

Assumptions:

- (1) Price-demand relationship is linear
- (2) Marginal cost per unit is constant at all output levels.
- (3) Fixed cost is constant throughout the range.

Answer to Question No. 12

Pictorial representation of facts



a) Effect of the current transfer pricing system on company's profit:

Current transfer price - Rs 29 (- external price Rs. 30 selling and pack

Expenses avoided Re. 1)

i) Optimal output (for DIV - A)

SP	VC	C	Demand	Total Contribution	Remarks
20	11	9	15000	135000	Contribution Division A will Decided to sell 10000 units to external market
30	11	19	10000	190000	
40	11	39	5000	145000	

ii) Optimal output (for DIV - B Transfers price 39)

SP	VC	TP	C	Demand	Total contribution	Remarks
80	39	29	12	7200	86400	Division B will Decided to sell 5000 units to Customers
90	39	29	22	5000	110000	
100	39	29	32	2800	89600	

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Note: Optimal output (for final product) company on a whole

SP	VC (div. B)	VC (Div. A)	TVC	UC	Demand	Total Contribution	Remarks
80	39	10	49	31	7200	223200	The optimal output for div. B 7200 units
90	39	10	49	41	5000	205000	
100	39	10	49	51	2800	142800	

Summary

Units	Div A Cont.	Div B Cont.	Total Contribution
7200	$7200 \times (29-10) = 136800$	$7200 \times 12 = 86400$	223200
5000	$5000 \times (29-10) = 95000$	$5000 \times 22 = 110000$	205000
2800	$2800 \times (29-10) = 53200$	$2800 \times 32 = 89600$	142800

Comments

Division A has decided its output level where its profit is maximum. Division B has also followed the foot steps of division A. But this has resulted in a loss of Rs $(223200-205000) = 18200$ to the company as a whole.

b) Transfer price is Rs 12

Units	Division A Contribution to FC	Division B	Company as a whole
7200	$(12-10) \times 7200 = 14400$	$7200 \times (80-39-12) = 208800$	223200
2800	$(12-10) \times 2800 = 5600$	$2800 \times (100-39-12) = 37200$	142800
5000	$(12-10) \times 5000 = 10000$	$5000 \times (90-39-12) = 195000$	205000

Comment

Division A Optimal output is 7200

Division B Optimal output is 7200

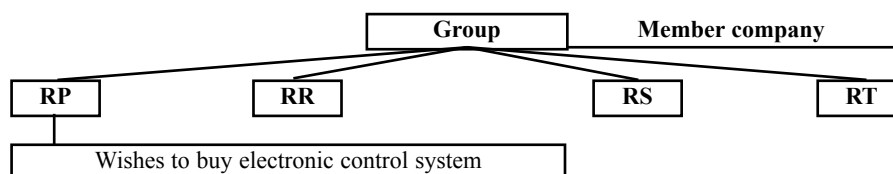
Optimal output from Company's view point is also 7200

Thus if the TP is 12/- there is perfect goal congruence

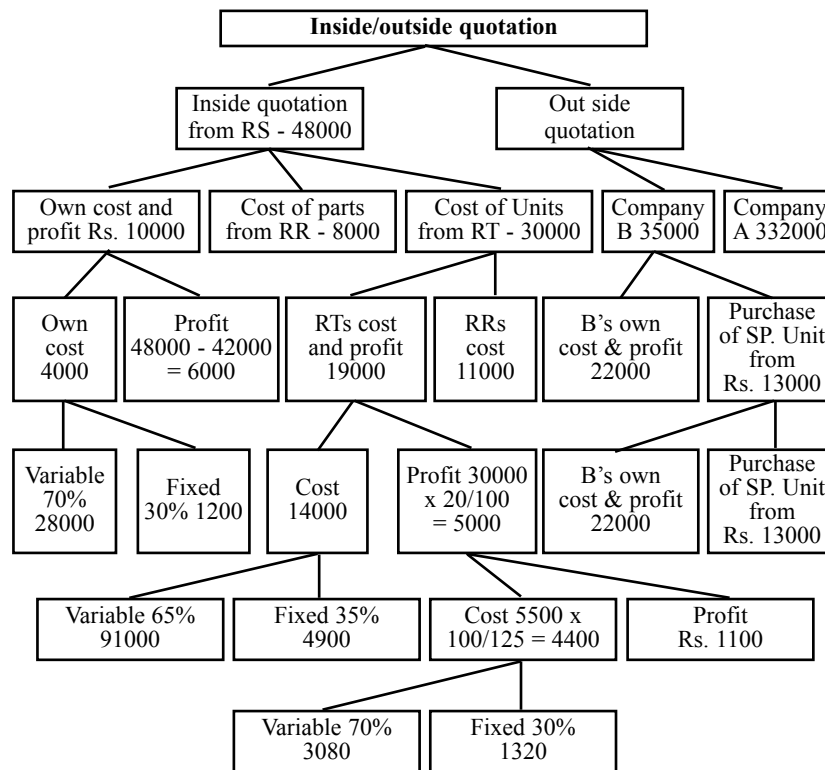
Assumptions

- i) division A has abundant capacity
- ii) Its existing 10000 units sale to external market is unaffected

Answer to Question No. 13



COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS



Evaluation of Quotations

Company	Quotation
➤ A	33200
➤ B (22000 + 13000 - 1100 - 1320)	32580
➤ RS (48000 - 1200 - 6000 - 5000 - 49000)	30900

Conclusion:-

Buy from RS (Since the cost is the lowest)

NOTE: Since RR is extremely busy with work outside the group the correct transfer price is the current market price.

Assumptions involved

- VC-are linear with respect to output changes
- RS and RT have sufficient spare capacity
Therefore the opportunity Cost is zero
- RP is not free to select its own source of supply

Answer to Question 14

(1) Scenario - 15; TP = MP

Division - A		Division - B		Total
Revenue		Revenue		
- Internal (80 x 30) =	2400	(40 x 100) =	4000	
- External (20 x 30) =	600	Less: Transfer Price (80 x 30) =	2400	
	3000			
Less: Variable cost				
(100 x 20)	2000	Less: Variable cost (40 x 12) =	480	
Less: Fixed Cost	500	Less: Fixed cost	720	
Profit	500		400	900

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(2) Scenario - 15; TP = VC

Division - A		Division - B		Total
Revenue		Revenue		
- External (20 x 30) =	600	(40 x 100) =	4,000	
- Internal (80 x 20 + 400) =	2,000	Less: Transfer Price		
	2,600	(80 X 20 + 400) =	2,000	
Less: Variable cost		Less: Variable cost (40 x 12) =	480	
(100 x 20) =	2,000			
Less: Fixed Cost	500	Less: Fixed Cost =	720	
	100		800	900

(3) Scenario - 23; TP = VC

Division - A		Division - B		Total
Revenue		Revenue		
- External (10 x 25) =	250	(30 x 90)	2,700	
- Internal (60 x 20 + 400) =	1,600	Less: Transfer Price		
		(60 x 20 + 400) =	1,600	
	1,850			
Less: Variable cost		Less: Variable cost		
(70 x 20) =	1,400	(30 x 12) =	360	
Less: Fixed cost	500	Less: Fixed cost	720	
	(50)		20	30

(4) Scenario - 23; TP = AS

Division - A		Division - B		Total
Revenue		Revenue (30 x 90)	2,700	
- External (10 x 25) =	250	Less: Transfer price (60 x 25) =	1,500	
- Internal (60 x 25) =	1,500		1,200	
	1,750	Less: Variable cost (30 x 12)	360	
Less: Variable cost				
(70 x 20) =	1,400			
Less: Fixed Cost	(500)	Less: Fixed Cost	(720)	
Loss	(150)		(120)	(30k)

(5) Scenario - 29; TP = MP

Division - A		Division - B		Total
Revenue		Revenue		
- External (70 x 35) =	2,450	(30 x 90) =	2,700	
- Internal (60 x 35) =	2,100	Less: Transfer price (60 x 35) =	2,100	
	4,550			
Less: Variable costs		Less: Variable cost		
(130 x 20) =	2,600	(60 x 12) =	360	
Less: Fixed costs	500	Less: Fixed Cost	720	
	1,450		(480)	970 K

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

(6) Scenario - 29 TP = VC.

Division - A		Division - B		Total
Revenue		Revenue (30 x 90)	2,700	
- External (70 x 35)	2,450	Less: Transfer Price		
- Internal (60 x 20 + 400)	1,600	(60 x 200 + 400) =	1,600	
		Less: Variable cost (30 x 12)	360	
	4,050	Less: Fixed Cost	720	
Less: Variable cost				
(130 x 20)	2,600			
Less: Fixed Costs	500			
	950		20	970 K

(7) Scenario - 29 TP = AS

Division - A		Division - B		Total
Revenue -		Revenue	2,700	
External (70 x 35) =	2,450	Less: Transfer price	1,500	
Internal (60 x 25) =	1,500			
	3,950			
Less: Variable cost	2,600	Less: Variable cost (30 x 12) =	360	
Less: Fixed Cost	500	Less: Fixed Cost	720	
	850		120	970 K

Part - 2

(a) Scenario - 23 TP = AS; SP = 55 (B)

(i) (From division -B's point of view)

SP (B)	=	55
Less: TP (A) (25 x 2)	=	50
Less: VC (B)	=	<u>12</u>
Loss		<u>(7)</u>

Conclusion: Overseas order should not be accepted.

Note:

External & Internal demand	=	70
Product A required to meet the overseas order (20 x 2)	=	40
		110

Total requirement it is less than 130.

(ii) Scenario - 29 TP=MP; SP(B) = 65;

SP (B)	=	65
Less: TP (A) (35 x 2)	=	70
Less: VC(B)	=	12
Loss		(17)

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Conclusion: Overseas order should not be accepted.

External & Internal requirement	=	130
Product A required to meet the overseas demand (20 x 2)	=	40
Total requirement it is less than 130 more		170

(b) From company's point of view:

(i)

SP (B)	=	55
Less: VC(A) (20 x 2)	=	40
Less: VC(B)	=	12
Contribution		3

Conclusion: Overseas order should be accepted.

(ii)

SP (B)	=	65
Less: VC(A)	=	40
Less: VC(B)	=	12
Gain	=	13

Contribution lost: $(35 - 20) \times 2 = 30/-$

(Since the capacity is the limiting factor) Loss = $30 - 13 = 17/-$ Order should not be accepted.

Answer to Question No. 15

1) Sales Budget

Product	Units	Price	Sales
Light coil	60,000	65	39,00,000
Heavy coil	40,000	95	38,00,000
		Total	77,00,000

2) Production budget (units)

	Light coil	Heavy coil
Sales	60,000	40,000
(+) Closing stock	25,000	9,000
85,000	49,000	
(-) Opening Stock	(20,000)	(8,000)
Production	65,000	41,000

3) Raw material budgeted purchase (Quantities)

I sheet metal	Light Coil	Heavy Coil	Total
Production Requirement	2,60,000	2,05,000	4,65,000
(+) Closing Stock			36,000
(-) opening Stock			(32,000)
Purchase			4,69,000

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

II Copper wire	Light Coil	Heavy Coil	Total
Production Requirement	130000	123000	253000
(+) Closing Stock			32000
(-) opening Stock			(29000)
Purchase			256000

III Platform	Light Coil	Heavy Coil	Total
Requirement	-	41000	41000
(+) Closing Stock			7,000
(-) opening Stock			(6,000)
Purchase			42,000

4) Raw material purchases Budget (Rupees)

Sheet metal	469000 x 8	= 3752000
Copper wire	256000 x 5	= 1280000
Platform	42000 x 3	= 126000
		= 5158000

5) Direct labour budget (Rupees)

Light Coil	2 x 65000 x 15	= 1950000
Heavy Coil	3 x 41600 x 20	= 2460000
Total		= 4410000

6) Manufacturing overhead budget

Purchasing and material handling (0.25 x 5032000)	1258000
Depreciation Utilities and inspection 4 x 10600 coils	424000
Shipping (1 x 106000)	106000
General manufacturing OH(3 x 253000 hours)	75900
	2547000

Answer to Question No. 16

(1) Revised Operating budget for the fourth quarter		
A Revenue	Rs.	
a) consulting fees from computer consulting system (con-1)	478125	
b) Consulting fees from management consulting (con-2)	468000	
c) Other revenue	10000	956125
B. Expenses		
a) Consultant salary expense (con-3)		510650
b) Travel of related expenses (con-4)		57875
c) General of administrative expenses (1,00,000 x 93%)		93000
d) Depreciation		40000
e) Corporate expense allocation (50,000 x 150%)		75000
		776525
C Revised operating income (for the fourth quarter)		179600

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Working note -1

- 1) Budgeted revenue (per quarter) - from computer consulting system =Rs. 421875
- 2) Hourly billing rate = Rs. 75
- 3) Hours = 5625
- 4) No. of computer consultants = 15
- 5) Hours per consultant = 375
- 6) Additional billing hours per consultant = 50
- 7) Revised total hours per consultant = 425
- 8) Revised total billing hour (7 x 14) =6375
- 9) Revised revenue (8x2) = 478125

Working note -2

- 1) Budgeted revenue (per quat.)-from management consulting system =Rs. 315000
- 2) Hourly billing rate = Rs. 90
- 3) Hours = 3500
- 4) No. of computer consultants = 10
- 5) Hours per consultant = 350
- 6) Additional billing hours per consultant = 50
- 7) Revised total hours per consultant = 400
- 8) Revised no of consultants = 13
- 9) Revised total billing hour = 5200
- 10) Revised revenue from management consulting system = 468000

Working note -3

(a)

(1) Annual salary of a management consultant	=	Rs. 50000
(2) Quarterly Salary (1 x ¼)	=	Rs. 12500
(3) Increase in salary (10%)	=	1250
(4) Revised quarterly salary per exclusive management (Without provision for Fringe benefits)	=	13750
(5) Fringe benefirs (40%)	=	5500
(6) Revised quarterly salary per existing management consultant (with fringe beniefits)	=	19250
(7) Revised quarterly salary for existing management consultants(6 x 10)	=	192500
(8) Quarterly salary for new management consultants (3 x 12500 x 140%)	=	52500
(9) Total quarterly salary for management consultants	=	245000

(b)

(1) Annual budgeted salary of a computer consultant		46,000
(2) Quarterly salary		11,500
(3) Increase in salary (10%)		1,150
(4) Revised quarterly salary (without fringle benefit)		12,650
(5) Fringe benefits (40%)		5,060
(6) Revised quarterly salary (with fringe benefits)		17,710
(7) No. of Computer Consultants		15
(8) Total revised quarterly salary		2,65,650
(c) Total revised consultants quarterly salary =		Rs.5,10,650

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Working note: 4

(1) Budgeted quarterly travel & related expenses	45,625
(2) Total Budgeted Billing hours (5,625 + 3,500)	9,125
(3) Expenses per hour	Rs.5
(4) Revised billing hours (6,375 + 5,200)	11,575
(5) Total expenses (11,575 x 5)	57,875

- (2) Any organization would prepare a revised operating budget when the assumption underlying the original budget are no longer valid. The assumption may involve factors outside/inside the company changes in assumptions involving external factors may include changes in demand for the company's product or services, changes in the cost of various inputs to the company, or changes in the economic / political environment in which the company operates. Changes in assumptions involving internal factors may include changes in company goals or objectives.

Answer to Question No. 17

Ford Ltd. - sells 15,000 units of a raft: Full Cost (P.U.) = Rs.200/-

(a) Computation of SP (P.U.)

Full cost (15,000 x 200)	=	30,00,000
+ Return (18,00,000 x 20%)	=	3,60,000
		33,60,000
Units		15,000
Unit SP		224

Mark up (%) = $24/200 \times 100\% = 12\%$

Profit = $24 \times 15,000 = 3,60,000/-$

(b) Markup = 40% on VC

VC = $224/140 \times 100 = 160/-$

(c) SP = 230

Units = 13,500

Contribution per unit = $230 - 160 = 70/-$

Total contribution = $13,500 \times 70$	=	9,45,000
Less: FC (40 x 15,000)	=	6,00,000
		3,45,000

(d)

Targeted sales (15,000 x 210)	=	31,50,000
Less: Targeted return (16,50,000 x 20%)	=	3,30,000
Target cost		28,20,000

Unit cost = $28,20,000/15,000 = 188/-$

Answer to Question No. 18

(1)

Competitive selling price	=	Rs.300/-
Less: Profit on Sales (300 x 10%)	=	30/-
Target cost		Rs.270/-

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Working note: 1

Current Selling Price	=	350
Less: Total unit cost	=	315
Profit		35

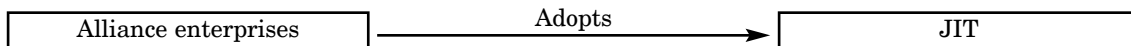
Profit on sales = $35/350 \times 100 = 10\%$

(2)

Cost		Benefits	
Lab cost increase =	15	Savings in setup, material handling, inspection flushed goods warehousing	55
		Savings in machine cost	5
Net cost savings =	49	Savings in warranty cost (10 x 40%)	4
	15		64

Total original unit cost	315	
Less: Benefits	49	
Revised unit cost	266	< 270 target cost.

Answer to Question No. 19:



Costs		Benefits	
(a) Depreciation on cost of re-modeled facilities (6,00,000/10)	60,000	(a) Savings of interest on amount blocked in inventories (30,00,000 x 12%) =	36,00,000
(b) Stock out costs	70,000	(b) Savings in insurance in prop. Taxes	27,000
		(c) Lease revenue (30,000 x 75% x 2)	45,000
		(d) Savings in warranty & repair costs	25,000
		(e) Salary earnings	30,000
	1,30,000		4,87,000

Savings due to JIT = 3,57,000/-

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Answer to Question No. 20

Week	12	11	10	9	8	7	6	5	4	3
Requirement of X	100 Units									
Planned Order release for X			100 Units							
Requirement of P & Q			100 Units (P) 200 Units (Q)							
Planned order release				200 (Q)		100 (P)				
Requirement of R + S for (P)						300 (R) 200 (S)				
Planned order release									300 (R) 200 (S)	
Requirement of P for Q				400 (P)						
Planned order release							400 (P)			
Requirement of R & S for (P)							1,200(R) 800(S)			
Planned order release										1,200(R) 800(S)
Summarised planned order release	12	11	10	9	8	7	6	5	4	3
			100(x)	200 (Q)		100 (P)	400 (P)		300(R) 200(S)	1,200 (S) 800 (S)

Answer to Question No. 21

$$LT = 4$$

$$EOQ = 45 \text{ kg}$$

Week	(in kg)								
	1	2	3	4	5	6	7	8	9
Production									
requirement (in kg)	24	-	29	11	-	5	19	27	18
Scheduled receipts	-	-	-	45	-	-	-	45	-
Stock at the end (54)	30	30	1	35	35	30	11	-16/29	11
Planned order release	-	-	-	45	-	-	-	-	-

Answer to Question No. 22

(a) Computation of total costs for each product

(Assumption: Overheads are absorbed based on machine hour basis)

Products	Units	(1)	(2)	(3)		(4)	Unit Cost
		DM	DL	Overhead		Total Cost	
				Machine Hour	Rs.		
A	120	4800	3360	480	9600	17760	148/-
B	100	5000	2100	300	6000	13100	131/-
C	80	2400	1120	160	3200	6720	84/-
D	120	7200	2520	360	7200	16920	141/-
			1300				

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Working note: 1

Total overheads = 26,000 (given)

Total machine hours = 1,300

Recovery rate (per machine hour = 20/-)

(b) Computation of total cost for each product (using ABC)

Products	Unit	DM	DL	No. of production runs	Set up cost	Ins./Qty Control	Stores requisition	SR (Stores receiving)	MH & D	Cost	Machine hours	MD	TC	Unit Cost
A	120	4800	3360	6	1500	200	20	900	12	1320	480	380	16330	136.08
B	100	5000	2100	5	1250	300	20	900	10	1100	300	2406	13256	132.56
C	80	2400	1120	4	1000	480	20	900	8	880	160	1283	7983	99.78
D	120	7200	2520	6	1500	200	20	900	12	1320	3600	2887	16927	141.06

Working note: 2

Cost	Amount	Cost drives	No. of Cost or	Cost per Unit of CD
Set up cost	5250	No. of production	21 =	250
Stores receiving	3600	Requisition raised	20 x 4 = 80	45
Insp / quality control	2100	No. of production	21	100
Material handling				
& despatch	4620	Orders less	42	110
MDC	10430	Machine hours	1300	8.02

(a)

	A	B	C	D
Unit costs under traditional system	148	131	84	141
Unit cost under ABC	136	133	99 +1 = 100	141
	12	2	16	-
	Over costed	Under coated	Under coated	

If cost + pricing is followed the selling price will differ under ABC (when compared with traditional method).

Answer to Question No. 23

(1) Advantages associated with ABC

- Enables through understanding of complex product costs and product profitability for improved resource management and pricing decisions.
- Allows management to focus on value added and non-value added activities. This results in eliminating non-value added activities and streamlining production process.
- Highlights the relationship between activities and identifies opportunities to reduce costs.
- Provides a more appropriate means of charging overheads/costs to products.

(2) Computation of contribution margin under traditional system.

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Particulars	PC Board	TV Board
	(Rs.)	(Rs.)
(a) SP (per unit)	300	150
(b) Direct material (P.U)	140	80
(c) Direct labour (P.U)	56	21
(d) Variable manufacturing overhead (P.U) - (wn-1)	16	6
(e) Machine related overhead	15	5
(f) Material handling cost (10% of direct materials)	14	8
(g) Contribution (per unit)	59	30

Working note - 1

(a) Variable management overhead		Rs.11,20,000
(b) Direct labour hours		2,80,000
(c) Variable manufacturing overhead per direct labour hour		4/-
(b) Machine setup	4.8	3.2
(c) Hazardous waste disposal	1.05	0.06
(d) Machine insertions	14	9.6
(e) Quality control	7	3.5
(f) General supplies	0.6	0.6
(g) Manual insertion	80	4
(h) Wave soldering	1.2	1.2
(i) Contribution (p.u.)	39.85	39.34
(j) Total contribution	15,94,000	25,57,100
(k) PVR	13.28%	26.22%

(3) Computation of contribution margin under ABC System.

Particulars	PC Board	TV Board
	Rs.	Rs.
(l) SP (per unit)	300	150
(m) Direct material (P.U.)	140	80
(n) Procurement	5.5	2.5
(o) Production scheduling	2	2
(p) Packaging & Shipping	4	4

- (4) The analysis using the previously reported costs shows that the unit contribution of the PC board is almost double that of the TV Board. On this basis, management is likely to accept the suggestion of the production manager and concentrate promotional efforts on expanding market for the PC Boards.

However, the analysis using ABC does not support this decision. This analysis shows that the unit contribution from each of the board is almost equal, and the total contribution from TV board exceeds that of PC Board by almost 10,00,000. as a percentage of selling price, the contribution from the TV Board is double that of PC Board (26% Vs 13%).

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Answer to Question No. 24

(a)

(i) Total production units (Pre-inspection)	Existing situation	Revised situation
Total Sales requirement	5,000	5,000
Add: Specification loss		
(5,000 x 5%)	250	
(5,000 x 2.5%)		125
	5,250	5,125
Add: Down grading at inspection		
(5,250 x 12.5/87.5)	750	
(5,725 x 7.5/92.5)		416
To total production units (pre-inspection)	6,000	5,541

(ii) Purchase of material - x:-

Materials required to meet pre-inspection production requirements

(6,000 x 8)	48,000	
(5,541 x 8)		44,328
Processing losses		
(4/96 x 48,000)	2,000	
(2.5/97.5 x 44,328)		1,137
Input to the process	50,000	45,465
Scrapped materials		
(5/95 x 50,000)	2,632	
(3/97 x 45,465)		1,406
Total purchases	52,632	46,871

(iii) Gross machine hours:-

	Existing	Revised
Initial requirement		
(6,000 x 0.6)	3,600	
(5,541 x 0.5)		2,771
Rectification hours		
(250 x 80% x 0.2 hours)	40	
(125 x 80% x 0.2 hours)		20
	3,640	2,791
Idle time		
(3,640 x 20/80)	910	
(2,791 x 12.5/87.5)		399
	4,550	3,190

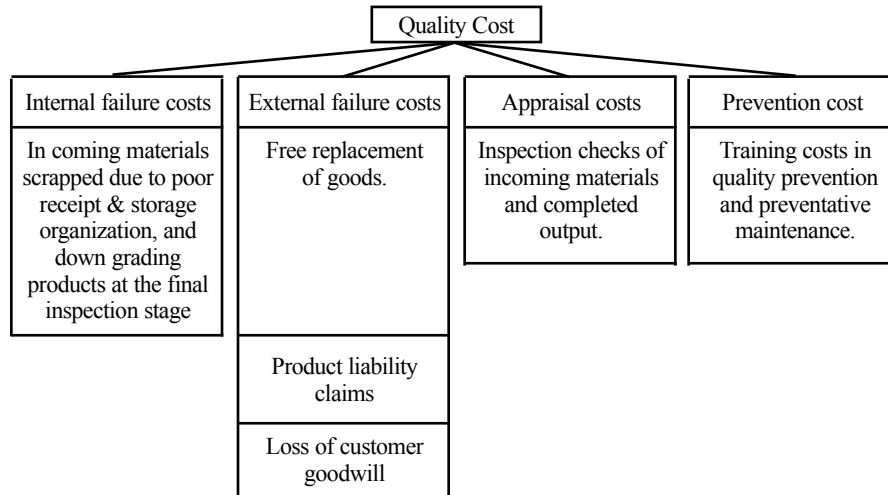
COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

(b) Profit & Loss Account

(A) Revenue	Existing	Revised
(a) First quality (5,000 x 100)	5,00,000	5,00,000
(b) Second Quality		
(750 x 100 x 70%)	52,500	
(416 x 100 x 70%)		29,120
(c) Third Quality		
(250 x 80% x 100 x 50%) =	10,000	
(125 x 80% x 100 x 50%) =		5,000
(d) Scrap sales		
(50 x 5)	250	
(25 x 5)		125
	5,62,750	5,34,245

(B) Cost	Existing	Revised
(a) Material - X		
(52632 x 4)	210528	
(46871 x 4)		187484
(b) Inspection and storage cost		
(52632 x 0.1)	5263	
(46871 x 0.1)		4687
(c) Machine costs		
(4,550 x 40)	1,82,000	
(3,190 x 40)		1,27,600
(d) Delivery of replacements		
(250 x 8)	2,000	
(125 x 8)		1,000
(e) Inspection & other cost	25,000	
(25,000 x 60%)		15,000
(f) Product liability		
(3% of 5,00,000 /-)	15,000	
(1% of 5,00,000 /-)		5,000
(g) Sundry fixed costs	60,000	
(60,000 x 90%)		54,000
(h) Prevention programme costs	20,000	60,000
Total	5,19,791	4,54,771
Net Profit (A-B)	42,959	79,474

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS



Answer to Question No. 25

(i) Computation of budgeted life-cycle operating income:

Revenue: (4,00,000 x 40)		1,60,00,000
Less:		
(a) R&D and designcost	10,00,000	
(b) Manufacturing cost		
• Variable 4,00,000 x 15	60,00,000	
• Batch cost (4,00,000/500 x 600)	4,80,000	
• Fixed cost	18,00,000	
• 82,80,000		
(c) Marketing costs		
• Variable 4,00,000 x 3.2	12,80,000	
• Fixed	10,00,000	
	22,80,000	
(d) Distribution costs		
• Batch (4,00,000/160 x 280)	7,00,000	
• Fixed	7,20,000	
	14,20,000	
(e) Customer related service costs (4,00,000 x 1.5)	6,00,000	
(f) Total cost (a to e)		1,35,80,000
Operating income:		24,20,000

(ii) % of budgeted product life cycle costs incurred till the R & D and design stage = $10,00,000 / 1,35,80,000 \times 100 = 7.36\%$.

(iii) The analysis reveals that 80% of the total product life cycle costs of the new watch will be locked in at the end of R & D and design stages when only 7.36% of the costs are incurred. The implication is that it will be difficult to alter/reduce the cost of Mx3 once design finalizes the design of Mx3. To reduce and manage total costs, Destiny must act to modify the design before the costs get locked in.

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

- (iv) market research finding:
- Increase in SP by 3/- leads to increase in sales by $4,00,000 \times 10\% = 40,000$ units.
 - Batch size increases by 10%.

Revenue $4,40,000 \times 37$		1,62,80,000
Less		
(a) R & D & design costs	10,00,000	
(b) Manufacturing costs		
• Variable $(4,40,000 \times 5)$	66,00,000	
• Batch $(600 \times 4,40,000/550)$	4,80,000	
• Fixed	18,00,000	
	98,80,000	
(c) Marketing costs		
• Variable $(3.20 \times 4,40,000)$	14,08,000	
• Fixed	10,00,000	
24,08,000		
(d) Distribution costs		
• Batch $(280 \times 4,40,000/176)$	7,00,000	
• Fixed	7,20,000	
	14,20,000	
(e) Customer service costs $(1.50 \times 4,40,000)$	6,60,000	
(f) Total cost (a to e)		1,43,68,000
Operating income		19,12,000

Conclusion: Price should not be reduced.

Answer to Question No. 26

Time taken for first batch=250 hours

Learning effect - 85%

Number of transistors in the batch = 25 nos.

Number of units to be assembled = 40 units

(in terms of batches) = $40/25 = 1.6$ batches.

$$Y = ax^b$$

a = 250 hours; x = 2.6 batches

$$b = \frac{\log 0.85}{\log 2} = \frac{-1+0.9294}{0.301} = \frac{-0.0706}{0.301}$$

$$= -0.2346$$

$$y = 250 \times (2.6)^{-0.2346}$$

$$\log y = \log 250 - 0.2346 \log 2.6$$

$$\log y = 2.3979 - 0.2346(0.4150)$$

$$\log y = 2.300541$$

$$Y = \text{antilog } (0.300541) \times 1000 = 199.7$$

$$\text{Total hours required} = 199.7 \times 2.6 = 519 \text{ hours}$$

$$\text{Less hours for 1st batch} = \underline{250 \text{ hours}}$$

$$\text{Hours taken for 1.6 new batches} = \underline{269 \text{ hours}}$$

$$\text{Average hours per transistor} = \frac{269}{40} = 6.73 \text{ hours (per unit)}$$

(in the new batch)

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Answer to Question No. 27

Computation of Direct labour

$$\begin{aligned}
 Y &= ax^b; \text{ Learning rate} = 85\% \\
 A &= \text{Rs. } 225000 \quad b = -0.2346 \\
 x &= \frac{25+1000}{25} = 41 \text{ batches} \\
 y &= 22500 \times (41)^{-0.2346} \\
 \text{Log } y &= \log 22500 - 0.2346 \log 41 \\
 \text{Log } y &= 4.3522 - 0.2346 (1.6128) \\
 \text{Log } y &= 3.97383712 \\
 y &= \text{antilog } (0.97383712) \times 10000 = 9414 \\
 \text{Total requirement} &= 385974 \\
 (9414 \times 41) \text{ Assumption first 25 units are not intended for sale} \\
 \text{Less: His 1st 2T guns} &\quad \underline{22500} \\
 \text{Direct labour for 1000 guns} &\quad \underline{363474} \\
 \\
 \text{Direct labour per gun} &= \frac{363474}{1000} = 363.474
 \end{aligned}$$

Computation of unit selling price

$$\begin{aligned}
 \text{a) Direct material } (24500/25) &= 980.00 \\
 \text{b) Direct labour} &= 363.41 \\
 \text{c) Variable Overheads (75\% of labour)} &= 272.60 \quad \text{Mark Up } 1198.50 (40/60) \\
 \text{d) Fixed overheads (50\% of direct labour)} &= \underline{181.74} \\
 \text{Total Cost} &= \underline{1797.75} \\
 \text{Selling price} &= 2996.25
 \end{aligned}$$

Answer to Question No. 28

a) Formulation:

$$\text{Maximize } Z = 7x_1 + 5x_2$$

Subject to:

$$3x_1 + x_2 \leq 48$$

$$2x_1 + x_2 \leq 40$$

$$x_1, x_2 \geq 0$$

b) Dual

$$\text{Minimize } 48y_1 + 40y_2$$

Subject to:

$$3y_1 + 2y_2 \geq 7$$

$$y_1 + y_2 \geq 5$$

$$y_1, y_2 \geq 0$$

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Converting Inequalities into equalities

$$\text{Minimize } Z = 48y_1 + 40y_2 + 0.S_1 + 0.S_2 + M.A_1 + M.A_2$$

Subject to:

$$3y_1 + 2y_2 - S_1 + A_1 = 7$$

$$y_1 + y_2 - S_2 + A_2 = 5$$

First table

FR	PROG	COST	QTY	Y ₁	Y ₂	S ₁	S ₂	A ₁	A ₂	R/R
-	A ₁	M	7	3	2	-1	0	1	0	7/2
1/2	A ₂	M	5	1	1	0	-1	0	1	5
I = Y ₂			C	48	40	0	0	M	M	
0 = A ₁			Z	4M	3M	-M	-M	M	M	
			C-Z	48-4M	40-3M	M	M	0	0	
			(NER)							

I Iteration

FR	PROG	COST	QTY	Y ₁	Y ₂	S ₁	S ₂	A ₁	A ₂	R/R
-1	Y ₁	40	7/2	3/2	1	-1/2	0	1/2	0	-7
1/2	A ₂	M	3/2	-1/2	0	1/2	-1	-1/2	1	3
I = S ₂			C	48	40	0	0	M	M	
0 = A ₂			Z	60-(M/2)	40	(M/2)-20	-M	20-(M/2)	M	
			C-Z	(M/2)-12	0	20-(M/2)	M	(3/2)M-20	0	
			(NER)							

A₂

A	5	1	1	0	-1	0	1
B	7/2	3/2	1	-1/2	0	1-2	0
(IR X KR)	3/2	-1/2	0	1/2	-1	-1/2	1

II Iteration

FR	Prog	Cost	QTY	Y ₁	Y ₂	S ₁	S ₂	A ₁	A ₂	R/R
Y ₁	40	5	1	1	0	-1	0	1		
S ₂	0	3	-1	0	1	-2	-1	2		
			C	48	40	0	0	M	M	
			Z	40	40	0	-40	0	40	
			C-Z	8	0	0	-40	M	M-40	
			(NER)							

Y₁

A	7/2	3/2	1	-1/2	0	1/2	0
B	-3/2	1/2	0	-1/2	1	1/2	-1
A-B	5	1	1	0	-1	0	1

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

a) optimal product mix:-

Product A:- 0 units

Product B:- 40 units

b) Shadow cost of Raw material = 0

Shadow cost of Labour hours = Rs. 5/hour

Answer to Question No. 29

- (a) This solution is optimal because all the numbers in NER is either negative or zero.
- (b) A Problem is said to be having multiple optimal solution if any of the non-basic variable has Zero as its value in the NER. Since this problem does not have Zero as the value of non-basic variable in NER, it has only one optimal solution.
- (c) The Problem also is not degenerate
- (d) A solution is said to be infeasible if the basic variable happens to be an artificial variable. In this solution both basic variables are not artificial variables and hence feasible.
- (e) Machine A has been used to its fullest capacity and has got an opportunity cost of Rs5/hour.
- (f) By producing 1 unit of x_1 , the profit will be reduced by Re.1 (See value of x_1 in NER). So the price has to be increased by Re 1 to avoid reduction in profit.

Answer to Question No. 30

I Formulation of Transportation Problem

	E	F	G	R	Supply
A	3	3	3	6	200
B	4	5	3	5	400
C	4	4	4	6	300
D	5	2	3	7	200
Demand	350	450	200	100	

II Obtaining IBFS using Vogel Method

	E	F	G	R	Supply	Difference
A	3 200	3	3	6 200/0	200/0	0/0/0/-/-
B	4 100	5	3 200	5 100	400/200	1/1/1/1/1
C	4 250	4 50	4	6 300/250/0	300/250/0	0/0/0/0/2
D	5	2 200	3	7 200/0	200/0	1/-/-/-/-
Demand	350/100	450/250/50/0	200/0	100		
Differ.	1/1/1/0/0	1/1/1/1/-	0/0/-/-/-	1/1/1/1/1		

Number of allocations = $m + n - 1$: so optimality test can be done

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

III Modi's Optimality Test

Allocated cells

$U_1 + V_2$	$= 3$
$U_2 + V_1$	$= 4$
$U_2 + V_3$	$= 3$
$U_2 + V_4$	$= 5$
$U_3 + V_1$	$= 4$
$U_3 + V_2$	$= 4$
$U_4 + V_2$	$= 2$

Values of U_1 to V_4 assuming $U_1=0$:

$U_2 = 1$; $U_3 = 1$; $U_4 = -1$;

$V_1 = 3$; $V_2 = 3$; $V_3 = 2$; $V_4 = 4$

Unallocated cells

Z_j	$C_j - Z_j(\text{NER})$
$U_1 + V_1 = 3$	$3 - 3 = 0$
$U_1 + V_3 = 2$	$3 - 2 = 1$
$U_1 + V_4 = 4$	$6 - 4 = 2$
$U_2 + V_2 = 4$	$5 - 4 = 1$
$U_3 + V_3 = 3$	$4 - 3 = 1$
$U_3 + V_4 = 5$	$6 - 5 = 1$
$U_4 + V_1 = 2$	$5 - 2 = 3$
$U_4 + V_3 = 1$	$3 - 1 = 2$
$U_4 + V_4 = 3$	$7 - 3 = 4$

The above solution is optimal since all the values in NER is either +ve (or) zero. It is also an example of Multiple-optimal solution.

Answer to Question No. 31

I Balancing the unbalanced problem

	1	2	3	4
A	13	10	9	11
B	15	17	13	20
C	6	8	11	7
D	0	0	0	0

II conversion of maximization problem to minimization by deducting all the numbers in the matrix form highest number

	1	2	3	4
A	7	10	11	9
B	5	3	7	0
C	14	12	9	13
D	20	20	20	20

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

III Row operations

	1	2	3	4
A	0	3	4	2
B	5	3	7	0
C	5	3	0	4
D	0	0	0	0

IV Covering zero's in III with minimum number of lines:-

	1	2	3	4
A	0	3	4	2
B	5	3	7	0
C	5	3	0	4
D	0	0	0	0

No of lines = order of matrix so we can proceed to make allocations

V Allocation

	1	2	3	4
A	0	3	4	2
B	5	3	7	0
C	5	3	0	4
D	0	0	0	0

A ➡ 1:	Rs 13
B ➡ 4:	Rs 20
C ➡ 3:	Rs 11
D ➡ 2:	<u>Rs 0</u>
Total Profit	<u>Rs 44</u>

Answer to Question No. 32

I Random Number coding

Time	Assembly A1			Assembly A2		
	Prob	Cum prob	RN. No	Prob	Cum prob	Rn. NO
1-3	0.1	0.10	00-09	0.20	0.20	00-19
1-4	0.15	0.25	10-24	0.40	0.60	20-59
2-4	0.40	0.65	25-64	0.20	0.80	60-79
3-4	0.25	0.90	65-89	0.15	0.95	80-94
4-5	0.10	1.00	90-99	0.05	1.00	95-99

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

II Simulation worksheet

S. no.	Assembly A1		Assembly A2		Total
	R. No	Time	R. No	Time	
1	41	12	34	11	23
2	83	13	43	12	25
3	36	12	02	10	22
4	75	13	05	10	23
5	74	13	28	11	24
6	74	13	76	12	25
7	11	11	83	13	24
8	94	14	11	11	25
9	60	10	89	13	23
10	34	12	24	11	23
11	49	12	43	11	23
12	19	11	15	10	21
13	54	12	15	10	22
14	08	10	80	13	23
15	93	14	09	10	24
					304

Expected process time = $304/15 = 20.266$ minutes

Answer to Question No. 33

I Random number coding

Activity	time	Probability	Cumulative Probability	Random number
A	3	0.2	0.2	00-19
	4	0.6	0.8	20-79
	5	0.2	1.00	80-90
D	45	0.8	0.8	00.79
		0.2	1.00	80-99
E	3	0.1	0.1	00-09
	5	0.3	0.4	10-39
F	5	0.2	0.2	40.69
	7	0.8	1.00	20-99
H	2	0.5	0.5	00.49
	3	0.5	1.00	50-69

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

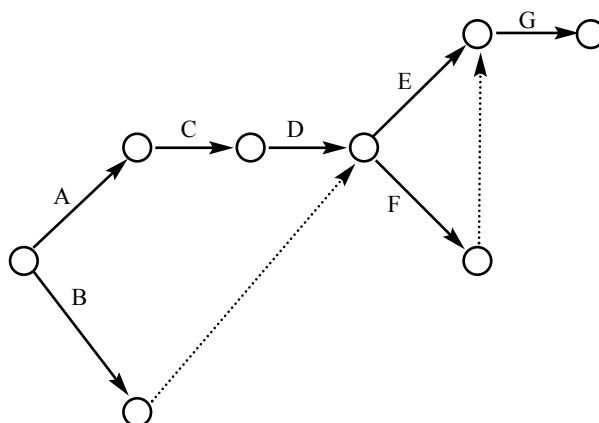
II Simulation worksheet

	A		B		C		D		E		F		G	
	R. No	Time	R. No	Time	R. No	Time	R. No	Time	R. No	Time	R. No	Time	R. No	Time
1	68	4	13	4	09	1	20	4	73	6	7	5	12	3
2	99	5	93	4	18	1	24	4	22	4	7	5	29	2
3	57	4	33	4	49	1	65	4	92	6	98	7	00	2
4	57	4	12	4	31	1	96	4	85	6	92	7	91	3
5	77	4	37	4	34	1	11	4	27	4	10	5	59	3

III Critical path and duration

	Path	Duration
1	A-C-D-F-G	18
2	A-C-D-F-G	17
3	A-C-D-F-G	18
4	A-C-D-F-G	20
5	A-C-D-F-G	17

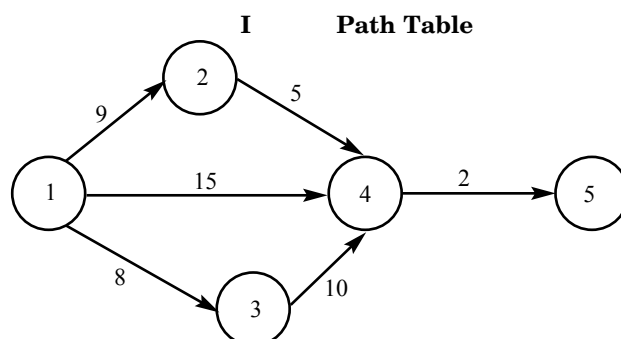
Network



Critical path and duration

$A+C$
 (OR)
 B + D + E
 (OR)
 Whichever is greater F +G
 is greater

Answer to Question No. 34



COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

No of days crashed

Paths	0	3	4	5	7	8
1-2-4-5	16	16	15	15	13	12
1-4-5	17	17	16	15	13	12
1-3-4-5	20	17	16	15	13	12

II Slash Table

Activities	Crash days available	Crash cost per day
1-2	$9-6=3$	40
1-3	$8-5=3/1$	50
1-4	$15-10=5/4/2$	60
2-4	$5-3=2/0$	20
3-4	$10-6=4/1/10$	30
4-5	$2-1=1/0$	80

III Cost Table

Project duration	Indirect cost	Crash cost	Total cost
20	2300	-	2300
17	1955	90	2045
16	1840	170	2010
15	1725	260	1985
13	1495	520	2015
12	1380	670	2050

IV Evaluation Table

Stage	Activities	Remarks	Crash cost	Crash cost
A	1-3 3-4 4-5	Crash 3-4 By 3 days	$3 \times 30 = 90$	90
B	1-3 3-4 4-5 1-4	Crash 4-5 by 1 day	$80 \times 1 = 80$	170
C	1-3 3-4 1-4	Crash 1-4 and 3-4 by 1 day	$1 \times 90 = 90$	260
D	1-3 1-4 1-2 2-4	Crash 1-3, 1-4 and 2-4 by 2 days	$2 \times 130 = 260$	520
E	1-3 1-4 1-2	Crash 1-3, 1-4 and 1-2 by 1 day	$1 \times 150 = 150$	670

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

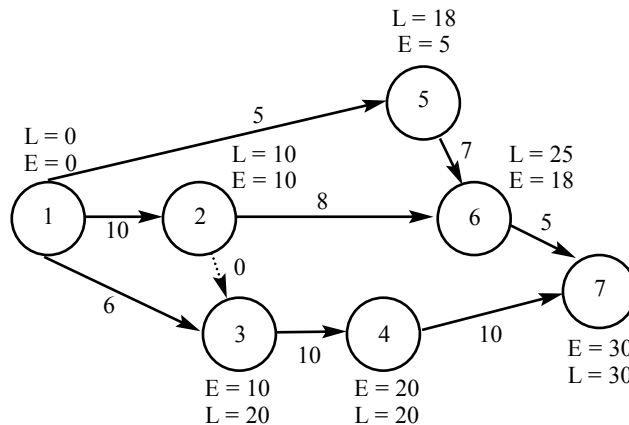
Points to be considered

- 1) Crash only the activities in critical path.
- 2) While selecting the activity to be crashed, select the activity with least crash cost.
- 3) While considering number of days to be crashed take into account two factors:-
 - ➡ crash days available (see slash table)
 - ➡ maximum no of days by which the activity can be crashed without making the path non-critical
- 4) in case of more than one critical path:-
 - ➡ crash that activity common to both the paths (or)
 - ➡ crash one activity from each path

Solutions:-

- a) normal project length = 20 days
- b) minimum project length = 12 days
- c) optimal project length = 15 days

Answer to Question No. 35



Activities	Duration	E	L	Total Float
1-2	10	0	0	0
1-3	6	0	4	4
1-5	5	0	13	13
2-3	0	10	10	0
2-6	8	10	17	7
3-4	10	10	10	0
4-7	10	20	20	0
5-6	7	5	18	13
6-7	5	18	25	7

Note

- i) EST = earliest start time
LST = latest start time

COST MANAGEMENT - TEST QUESTIONS & SOLUTIONS

Halt Time	Available	Activities	TF	Men	Days	Rank	Allocation	Idle resource
0	R1 to R4	1-2	0	1	10	I	R1	R4
		1-3	4	2	6	II	R2 & R3	
		1-5	13	3	5	III	-	
6	R2, R3 & R4	1-5	7	3	5	NR	R2, R3 & R4	Nil
10	R1	2-6	7	1	8	II	R1	Nil
		3-4	0	2	10	I	NP	
11	R2, R3 & R4	5-6	13	1	10	II	R4	Nil
		3-4	0	2	7	I	R2 & R3	
18	R1 & R4	6-7	7	2	5	NR	R1 & R4	Nil
21	R2 & R3	4-7	0	3	10	NR	NP	R2 & R3
23	R1 to R4	4-7	0	3	10	NR	R1 to R3	R4

NOTE:

- 2) NP:- Not Possible
- 3) NR:- Not Required

Comments:-

- 1) Total no. of days required to complete this project with 4 persons is $(23+10) = 33$ days
- 2) Ranking of jobs has been done in accordance with the total float of the job.

Loading Chart

