

CVP ANALYSIS & DECISION MAKING

BASIC CONCEPTS & FORMULAE

1. Marginal Costing

According to CIMA, Marginal costing is the system in which variable costs are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution.

Marginal costing is not a distinct method of costing like job costing, process costing, operating costing, etc. but a special technique used for marginal decision making. Marginal costing is used to provide a basis for the interpretation of cost data to measure the profitability of different products, processes and cost centre in the course of decision making.

2. Cost-volume-profit analysis

Cost-volume-profit analysis (as the name suggests) is the analysis of three variable viz., cost, volume and profit. Such an analysis explores the relationship existing amongst costs, revenue, activity levels and the resulting profit. It aims at measuring variations of cost with volume. In the profit planning of a business, cost-volume-profit (C-V-P) relationship is the most significant factor.

3. Important Factors in Marginal Costing Decisions

In all recommendations of marginal costing decisions, the following factors are to be considered:

- (i) Whether the product or production line in question makes a contribution.
- (ii) Where a choice is to be made between two courses of action, the additional fixed overhead, if any, should be taken into account.
- (iii) The continuity of demand after expansion or renovation or installation of the sophisticated machine and its impact on the selling price should also be considered.
- (iv) Cost is not the only criterion for decision making. Non-cost factors like the necessity to retain the experienced employees, etc. should also be considered.

4. Pricing Decisions under Special Circumstances

If goods were sold in the normal circumstances under normal business conditions, the price would cover the total cost plus a margin of profit. Selling prices are not always determined by the cost of production. They may be determined by market conditions but in the long run they tend to become equal to the cost of production of marginal firm. Therefore, a business cannot continue to sell below the total cost for a long period. Occasionally, a firm may have to sell below the total cost.

*The **problem of pricing** can be summarised under three heads:*

- (i) Pricing in periods of recession,
- (ii) Differential selling prices, and
- (iii) Acceptance of an offer and submission of a tender.

5. Make or Buy Decision

Very often management is faced with the problem as to whether a part should be manufactured or it should be purchased from outside market. Under such circumstances two factors are to be considered:

- (a) whether surplus capacity is available, and
- (b) the marginal cost.

6. Shut Down or Continue Decision

Very often it becomes necessary for a firm to temporarily close down the factory due to trade recession with a view to reopening it in the future. In such cases, the decision should be based on the marginal cost analysis. If the products are making a contribution towards fixed expenses or in other words if selling price is above the marginal cost, it is preferable to continue because the losses are minimised. By suspending the manufacture, certain fixed expenses can be avoided and certain extra fixed expenses may be incurred depending upon the nature of the industry, say, for example, extra cost incurred in protecting the machinery. So the decision is based on as to whether the contribution is more than the difference between the fixed expenses incurred in normal operation and the fixed expenses incurred when the plant is shut down.

7. Export V/S Local Sale Decision

When the firm is catering to the needs of the local market and surplus capacity is still available, it may think of utilising the same to meet export orders at price lower than that prevailing in the local market. This decision is made only when the local sale is earning a profit, i.e., where its fixed expenses have already been

recovered by the local sales. In such cases, if the export price is more than the marginal cost, it is preferable to enter the export market. Any reduction in the price prevailing in the local market to fulfil surplus capacity may have adverse effect on the normal local sales. Dumping in the export market at a lower price will not, however, have any such adverse effect on local sales.

8. Expand or Contract Decision

Whenever a decision is to be taken as to whether the capacity is to be expanded or not, consideration should be given to the following points:

- (a) Additional fixed expenses to be incurred.
- (b) Possible decrease in selling price due to increase in production.
- (c) Whether the demand is sufficient to absorb the increased production.

9. Product Mix Decision

Many times the management has to take a decision whether to produce one product or another instead. Generally decision is made on the basis of contribution of each product. Other things being the same the product which yields the highest contribution is best one to produce. But, if there is shortage or limited supply of certain other resources which may act as a key factor like for example, the machine hours, then the contribution is linked with such a key factor for taking a decision.

10. Price-Mix Decision

When a firm can produce two or more products from the same production facilities and the demand of each product is affected by the change in their prices, the management may have to choose price mix which will give the maximum profit, particularly when the production capacity is limited. In such a situation, the firm should compute all the possible combinations and select a price-mix which yields the maximum profitability.

BASIC FORMULAS

- 1. Sales-Variable Cost = Contribution = Fixed Cost + Profit
- 2.
$$\begin{aligned} \text{P/V ratio (or C/S ratio)} &= \frac{\text{Contribution}}{\text{Sales}} \\ &= \frac{\text{Contribution per unit}}{\text{Selling price per unit}} \\ &= \frac{\text{Change in Contribution}}{\text{Change in Sales}} \end{aligned}$$
- 3. Break-even Point: Point where there is no profit or no loss.
 - (i) at BEP, Contribution = Fixed CostThus, Break Even Sales (in sales value) = Fixed Cost ÷ P/V ratio

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4. Margin of safety $= \text{Sales} - \text{BEP sales}$
 $= \text{Contribution} / \text{PV ratio} - \text{Fixed cost} / \text{PV ratio}$
 $= \text{Profit} / \text{PV ratio}$
5. BEP Calculation in different scenario:
- (i) With out limiting factor (non- attributable to a single product)
BEP in units $= \text{Fixed cost} \div \text{Average contribution p.u.}$
(when sales mix in units are given)
BEP in Rs. $= \text{Fixed cost} \div \text{composite p/v ratio}$
(when sales mix in rupee are given)
where composite p/v ratio $= \sum [\text{Sales Mix} \times \text{P/V Ratio}]$
- (ii) With limiting factor (attributable to a single product)
Find contribution per limiting factor & give rank. Find total contribution from 1st rank product. Calculate the amount of fixed cost still to recover. Whether it can be recovered by 2nd rank product or not ?
- (iii) For Perishable product apply the same concept in case of opening stock with different variable cost.
- e. BEP in case of process costing is expressed in terms of total raw material input
- f. In capital budgeting, BEP is that sales volume where $\sum \text{discounted Cash in flow} = \sum \text{discounted Cash out flow}$. In case of perpetuity, the financing charge p.a.= CIF pa
- g. Potential BE: On the basis of sales out of current period production only.
- h. Multiple BE: Different BE due to change in sales price, variable costs & fixed costs for different production level.
- i. Cash BEP = Cash fixed cost , contribution p.u. So do not consider the sunk cost.
- j. BEP for decision making purpose: Accept that proposal where BEP is lowest provided the profit can not be calculated.
6. Shut down point $= \frac{\text{Total fixed cost} - \text{Shut down costs}}{\text{Contribution per unit}}$

Question 1

Enumerate the limitations of using the marginal costing technique.

Answer

Marginal costing is defined as the ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs. Limitations of Marginal Costing Techniques:

The limitations of using the marginal costing technique are as follows:

1. It is difficult to classify exactly the expenses into fixed and variable category. Most of the expenses are neither totally variable nor wholly fixed.
2. Contribution itself is not a guide unless it is linked with the key factor.
3. Sales staff may mistake marginal cost for total cost and sell at a price; which will result in loss or low profits. Hence, sales staff should be cautioned while giving marginal cost.
4. Overheads of fixed nature cannot altogether be excluded particularly in large contracts, while valuing the work-in-progress. In order to show the correct position fixed overheads have to be included in work-in-progress.
5. Some of the assumptions regarding the behaviour of various costs are not necessarily true in a realistic situation. For example, the assumption that fixed cost will remain static throughout is not correct.

Question 2

Briefly discuss on curvilinear CVP analysis.

Answer

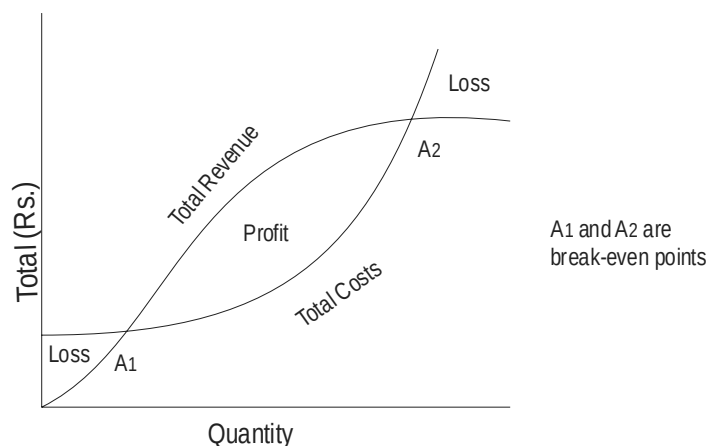
In CVP analysis, the usual assumption is that the total sales line and variable cost line will have linear relationship, that is, these lines will be straight lines. However, in actual practice it is unlikely to have a linear relationship for two reasons, namely:

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

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and the variable cost per unit may increase after reaching a particular level of output.

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



Question 3

A company manufactures two types of herbal product, A and B. Its budget shows profit figures after apportioning the fixed joint cost of Rs.15 lacs in the proportion of the numbers of units sold. The budget for 2002, indicates:

	A	B
Profit (Rs.)	1,50,000	30,000
Selling price / unit (Rs.)	200	120
P/V ratio (%)	40	50

You are required to advise on the best option among the following, if the company expects that the number of units to be sold would be equal.

- Due to exchange in a manufacturing process, the joint fixed cost would be reduced by 15% and the variables would be increased by 7½ %.
- Price of A could be increased by 20% as it is expected that the price elasticity of demand would be unity over the range of price.
- Simultaneous introduction of both the option, viz, (i) and (ii) above.

Answer

1. Contribution per unit of each product:

	<i>Product</i>	
	<i>A</i>	<i>B</i>
	<i>Rs.</i>	<i>Rs.</i>
Contribution per unit	80	60
(Sales × P/V ratio)	(Rs.20 × 40%)	(Rs.12 × 50%)

2. Number of units to be sold:

We know that:

Total contribution – Fixed cost = Profit

Let x be the number of units of each product sold, therefore:

$$(80x + 60x) - \text{Rs.15,00,000} = \text{Rs.1,50,000} + \text{Rs.30,000}$$

$$\text{or } x = 12,000 \text{ units}$$

- (i) *Option:* Increase in profit when due to change in a manufacturing process there is reduction in joint fixed cost and increase in variable costs.

	<i>Rs.</i>
Revised contribution from 12,000 units of A due to 7.5% increase in variable cost (12,000 units (Rs.200 – Rs.129))	8,52,000
Revised contribution from 12,000 units of B due to 7.5% increase in variable cost 12,000 units (Rs.120 – Rs.64.50)	6,66,000
Total revised contribution	15,18,000
Less: Fixed cost (Rs.15,00,000 – 15% × Rs.15,00,000)	12,75,000
Revised Profit	2,43,000
Less: Existing profit	1,80,000
Increase in profit	63,000

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- (ii) Option: Increase in profit when the price of product A increased by 20% and the price elasticity of its demand would be unity over the range of price.

Rs.

Budgeted revenue from Product A (12,000 units × Rs.200)	24,00,000
Revised demand (in units) (Rs.24,00,000 / Rs.240)	10,000
Revised contribution (in Rs.) [10,000 units × (Rs.240 – Rs.120)]	12,00,000
Less: Existing contribution (12,000 units × Rs.80)	9,60,000
Increase in profit (contribution)	2,40,000

*Note: Since price elasticity of demand is 1, therefore the revenue in respect of products will remain same.

- (iii) Option: Increase in profit on the simultaneous introduction of above two options

Rs.

Revised contribution from Product A [10,000 units (Rs.240 – Rs.129)]	11,10,000
Revised contribution from Product B [12,000 units (Rs.120 – Rs.64.50)]	6,66,000
Total revised contribution	17,76,000
Less: Revised fixed cost	12,75,000
Revised profit	5,01,000
Less: Existing profit	1,80,000
Increase in profit	3,21,000

Advise: A comparison of increase in profit figures under above three options clearly indicates that the option (iii) is the best as it increases the profit of the concern by Rs.3,21,000.

Note: The budgeted profit/(loss) for 2002 in respect of products A and B should be Rs.2,10,000 and (Rs.30,000) respectively instead of Rs.1,50,000 and Rs.30,000.

Question 4

“Use of absorption costing method for the valuation of finished goods inventory provides incentive for over-production.” Elucidate the statement.

Answer

When absorption costing method is used, production fixed overheads are charged to products and are included in product costs. Consequently, the closing stocks are valued on total cost (including fixed overheads) basis. The net effect is that the charge of fixed overheads to P/L account gets reduced, if the closing stock is greater than the opening stock. This situation has the effect of inflating the profit for the period.

Where stock levels are likely to fluctuate significantly, profits may be distorted if calculated on absorption costing basis. If marginal costing is used, since the fixed costs are charged off to P/L account as period cost, such a situation will not arise. The impact of using absorption costing on profits can be summarised as under:

- When sales are equal to production, profits will be the same under absorption costing and marginal costing.
- If production is higher than sales, the absorption costing will post higher profits than marginal costing.
- If sales are in excess of production, absorption costing will show lower profits than marginal costing.

Since profit calculation in absorption costing can produce strange result, the managers may deliberately alter the stock levels to influence the profits if absorption costing is used. Hence, it is true to say that if absorption costing method is used managers have the incentive to over produce to show better result.

Question 5

A Pharmaceutical company produces formulations having a shelf life of one year. The company has an opening stock of 30,000 boxes on 1st January, 2005 and expected to produce 1, 30,000 boxes as was in the just ended year of 2004. Expected sale would be 1,50,000 boxes. Costing department has worked out escalation in cost by 25% on variable cost and 10% on fixed cost. Fixed cost for the year 2004 is Rs40 per unit. New price announced for 2005 is Rs100 per box. Variable cost on opening stock is Rs40 per box. You are required to compute breakeven volume for the year 2005.

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Answer

Shelf life is one year hence opening stock of 30,000 boxes is to be sold first. Contribution on these boxes is $30,000(100 - 40) = \text{Rs}18,00,000$.

In the question production of 2004 is same as in 2005. Hence fixed cost for the year 2004 is Rs52, 00,000 ($1, 30,000 \times 40$). Therefore fixed cost for the year 2005 is Rs57, 20,000 ($52, 00,000 + 10\% \text{ of } 52, 00,000$).

Variable Cost for the year 2005 ($\text{Rs}40 + 25\% \text{ of Rs}40$) = Rs50 per Unit

Hence Contribution per unit during 2005 is Rs50 ($100 - 50$)

Break even volume is the volume to meet the fixed cost i.e. fixed cost equals to contribution. Therefore, remaining fixed cost of Rs39, 20,000 ($57, 20,000 - 18, 00,000$) to be recovered from production during 2005.

Production in 2005 to reach BEP = $3920000 / 50 = 78,400$ units

Therefore BEP for the year 2005 is 1, 08,400 boxes ($30000 + 78400$)

Question 6

Jay Kay Limited is a single product manufacturing company. The following information relates to the months of May and June, 2003:

	May	June
	Rs.	Rs.
(i) Budgeted Costs and Selling prices:		
Variable manufacturing cost per unit	2.00	2.20
Total fixed manufacturing cost (based on budgeted output of 25,000 units per month)	40,000	44,000
Total fixed marketing cost	14,000	15,400
Selling price per unit	5.00	5.50
(ii) Actual production and sales:		
	Units	Units
Production	24,000	24,000
Sales	21,000	26,500
(iii) There was no stock of finished goods at the beginning of May, 2003. There was no wastage or loss of finished goods during May or June, 2003.		
(iv) Actual costs incurred corresponded to those budgeted for each month.		

CVP Analysis & Decision Making

You are required to calculate the relative effects on the monthly operating profits of applying: (i) Absorption costing and (ii) Marginal costing.

Answer

(a) Quantity tally:

		<i>May 2003</i>	<i>June 2003</i>
Opening Stock	units	—	3,000
Production	units	24,000	24,000
Total	units	24,000	27,000
Sales	units	21,000	26,500
Closing Stock	units	3,000	500
Fixed manufacturing overheads	Rs.	40,000	44,000
Budgeted output	units	25,000	25,000
Fixed overheads absorption rate per unit	Rs.	1.60	1.76

(i) Profitability based on absorption costing:

	<i>May 2003</i>	<i>June 2003</i>
	<i>Rs.</i>	<i>Rs.</i>
<i>Sales:</i>		
May: 21,000 units @ Rs. 5.00	1,05,000	
June: 26,500 units @ Rs. 5.50		1,45,750
<i>Production Costs:</i>		
Variable: May 24,000 units @ Rs. 2.00	48,000	
June 24,000 units @ Rs. 2.20		52,800
Fixed: May 24,000 units @ Rs. 1.60	38,400	
June 24,000 units @ Rs. 1.76		42,240
Total production costs	86,400	95,040
<i>Add: Opening stock</i>		
May Nil		
June 3,000 units @ Res. 3.60*		10,800
Total	86,400	1,05,840

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Less: Closing stock		
May 3,000 units @ Rs. 3.60*	10,800	
June 500 units @ Rs. 3.96*		1,980
Production cost of goods sold	75,600	1,03,860
Marketing fixed costs	14,000	15,400
Total cost of goods sold	<u>89,600</u>	<u>1,19,260</u>
Profit (Sales – COGS)	15,400	26,490
Budgeted output	25,000 units	
Actual output	24,000 units	
Shortfall	1,000 units	
Under recovery of fixed overheads		
May 1,000 units @ Rs. 1.60	1,600	
June 1,000 units @ Rs. 1.76		1,760
Net profit	<u>13,800</u>	<u>24,730</u>

*Total cost = VC + FC

May $2.00 + 1.60 = 3.60$

June $2.20 + 1.76 = 3.96$

(ii) Profitability based on marginal costing:

	May 2003	June 2003
	Rs.	Rs.
Sales	1,05,000	1,45,750
Production cost – variable	48,000	52,800
Add: Opening stock		
May Nil		
June 3,000 units @ Rs. 2.00		<u>6,000</u>
Total	48,000	58,800
Less: Closing stock		
May 3,000 units @ Rs. 2.00	6,000	
June 500 units @ Rs. 2.20		1,100
Variable cost of goods sold	42,000	57,700

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Contribution			63,000	88,050
<i>Fixed costs:</i>	May	June		
Production	40,000	44,000		
Marketing	14,000	15,400	54,000	59,400
Net profit			9,000	28,650

Question 7

X Ltd. manufactures a semiconductor for which the cost and price structure is given below:

	<i>Rs. per unit</i>
<i>Selling price</i>	500
<i>Direct material</i>	150
<i>Direct labour</i>	100
<i>Variable overhead</i>	50

Fixed cost = Rs. 2 lakhs.

The product is manufactured by a machine, whose spare part costing Rs. 2,000 needs replacement after every 100 pieces of output. This is in addition to the above costs. Assume that no defectives are produced and that the spare part is readily available in the market at all times at Rs. 2,000.

- (i) Prepare the profitability statement for production levels of 2,000 units and 3,000 units, when fixed cost = Rs. 1 lakhs.*
- (ii) What is the break-even point (BEP) for the above data?*
- (iii) Comment on the BEP, if the fixed cost can be reduced to Rs. 1,80,000 from the existing level of 2 lakhs.*

Answer

- (i) X Ltd. Profitability Statement:**

	Volume Level	
Particulars	2000 units	3000 units
	Rs.'000	
Sales	1,000	1,500

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Variable costs		
Direct Material	300	450
Direct Labour	200	300
Variable overhead	100	150
Part costs*	40	60
Fixed cost	100	100
Total cost	740	1,060
Profit	260	440

*Part cost: $\frac{2,000}{100} \times 2,000 = 40,000$ $\frac{3,000}{100} \times 60,000 = 2,000$

- (ii) **For computing the BEP:** Parts cost although a step fixed cost can be considered as variable for the limited purpose of computing the range in which BEP occurs.

The variable parts cost per unit is Rs. $20 \left(\frac{2,000}{100} \right)$.

Range in which the BEP occur	$\frac{1,00,000}{(200 - 20)} = 555.55$	$\frac{2,00,000}{(200 - 20)} = 1,111.11$
Range	501–600	1,101–1,200
General Fixed Cost	1,00,000*	2,00,000
Parts cost	$(6 \times 2,000) = 12,000$	$(12 \times 2,000) = 24,000$
Total Fixed Cost	1,12,000	2,24,000
Gross Contribution/unit**	200	200
BEP	560 units	1,120 units

**Gross Contribution per unit

Sales – Direct Material – Direct Labour – Variable Overheads

Rs. 500 – Rs. 150 – Rs. 100 – Rs. 50 = Rs. 200

- (iii) When fixed cost is Rs. 1,80,000. Range of BEP will be $\frac{1,80,000}{180} = 1,000$ (901–1,000)

Since the BEP of 1,000 falls on the upper most limits in the range 901 – 1,000 there will be one more BEP in the subsequent range in 1,001 – 1,100.

Range	901 – 1,000	1,001 – 1,100
	Rs.	Rs.
Gross fixed cost	1,80,000	1,80,000
Parts cost	20,000	22,000
	$10 \times 2,000$	$11 \times 2,000$
Total fixed cost	2,00,000	2,02,000
Gross contribution/unit	200	200
BEP	1,000 units	1,010 units

Question 8

A company has produced 1,500 units against a budgeted quantity of 2,000 units. Actual sales were 1,300 units. The company's policy is to value stocks at standard absorption cost.

Other data are:

<i>Direct material</i>	<i>Rs. 100 per unit</i>
<i>Direct labour</i>	<i>Rs. 100 per unit at normal efficiency</i>
<i>Variable OH</i>	<i>Rs. 50 per unit</i>
<i>Fixed OH at budgeted capacity</i>	<i>Rs. 1,00,000</i>
<i>Variable selling OH</i>	<i>Rs. 26,000</i>
<i>Budgeted fixed selling OH</i>	<i>Rs. 30,000</i>
<i>Actual fixed selling OH</i>	<i>Rs. 25,000</i>
<i>Selling price</i>	<i>Rs. 400 per unit</i>

There was no opening stock.

- (i) *Present the profitability statement under absorption costing system.*
- (ii) *Assuming actual labour was 25% below normal efficiency and that 100 units of production had to be scrapped after complete manufacture, compute the actual profit or loss.*
- (iii) *Reconcile the profits under (i) and (ii) above.*

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Answer

(i & ii) Profitability under absorption costing system Actual profit and loss account

Particulars	Rs. 000's	Particulars	Rs. 000's
Sales (1,300×400)	520	Sales (1,300×400)	520
Absorption costs		Closing Stock (100×300)	30
Opening Stock	Nil	Total	550
Cost of production		Cost	
1,500 units × 300	450	Direct materials (1,500×100)	150
Less: Closing stock (200×300)	60	Direct labour (1,500×100/75%)	200
Net Absorption costs	390	Variable overhead (1,500×50)	75
Add: Under-absorption (500×50)	25	Fixed manufacturing overhead	100
Total absorption costs	415	Fixed Selling overhead	25
Gross profit	105	Variable selling overhead	26
Less: Selling overhead variable	26	Total costs	576
Selling overhead fixed	25		
Profit/(loss)	54	Profit / (Loss)	(26)

Working Notes:

	Rs.	Units
Absorption cost per unit		Budgeted capacity 2,000
Direct materials	100	Production 1,500
Direct labour	100	Under-absorption 500
Variable overhead	50	Sales 1,300
Fixed Overhead (1,00,000 / 2,000)	50	Closing stock 200
Total	<u>300</u>	

(iii) Reconciliation

	Rs. 000's
Profit under absorption costing	54
Less: Labour inefficiency**	(50)
Less: Value of units scrapped	(30)
Actual profit / (loss)	(26)

** (1,500 × (133 1/3 – 100))

Note: In case budgeted fixed selling overheads are considered while arriving at absorption profit a saving of Rs. 5,000 shall need to be identified as part of reconciliation.

Question 9

The following information of a company is available for the year 2006:

	Rs.
Sales	40,000
Raw materials	20,000
Direct wages	6,000
Variable and fixed OH	10,000
Profit	4,000
Units sold	200 Nos.

In the year 2007, wages rate will increase by 50% and fixed cost will decrease by Rs. 600. If 300 units are sold in 2007, the total fixed and variable OH will be 11,400. How many units should be sold in 2007, so that the same amount of profit per unit as in year 2006 may be earned?

Answer

Particulars (Data per unit)	2006	2007
	Rs.	Rs.
Selling price (40,000 /200)		200
Raw materials (20,000 /200)		100
Direct wages (6,000 /200)	30	(30 ×150%) 45
Variable overhead		20
Total variable cost		165
Contribution		35
Profit per unit (4,000 /200)		20
Net contribution per unit to cover fixed overheads		15
Fixed overheads	6,000	5,400
No. of units		5,400/15 = 360 units

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Working Notes:

No. of units sold	200	300
Total variable and fixed overheads	10,000	$11,400 + 600 = 12,000$
Differential cost in 2007		100 units Rs. 2,000
Variable overhead per unit		$2,000 / 100 = 20$
Total variable cost	4,000	6,000
Total fixed cost	6,000	$(6,000 - 600) 5,400$

Question 10

A company makes 1,500 units of a product for which the profitability statement is given below:

		Rs.
Sales		1,20,000
Direct materials	30,000	
Direct labour	36,000	
Variable OH	<u>15,000</u>	
Subtotal variable cost		81,000
Fixed cost		<u>16,800</u>
Total cost		<u>97,800</u>
Profit		<u>22,200</u>

After the first 500 units of production, the company has to pay a premium of Rs. 6 per unit towards overtime labour. The premium so paid has been included in the direct labour cost of Rs. 36,000 given above.

You are required to compute the Break-even point.

Answer

Data / Unit	1 – 500	501 – 1,500
	Rs.	Rs.
Sales $(1,20,000 / 1,500)$	80	80
Direct material $(20,000 / 1,000)$	20	20
Direct labour	20	26
Variable overheads $15,000 / 1,500$	10	10

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Contribution	30	24
No. of units	500	
Total contribution	15,000	
Fixed costs	16,800	
Shortfall	1,800	
No. of units required above 500 to recover shortfall		$1,800 / 24 = 75$
Break even point		$(500 + 75) = 575$ units

Let X be the Direct Labour per unit upto 500 units.

Total Direct Labour $500X + 1,000 (X + 6) = 36,000$

$$1,500X + 6,000 = 36,000$$

$$X = 20.$$

Therefore, up to 500 units the Direct Labour is Rs. 20. After 500 units it is Rs. 26.

Question 11

A Ltd. Makes and sells a single product. The company's trading results for the year are:

Figs. – Rs. '000 (Year 2007)

Sales		3,000
Direct materials	900	
Direct labour	600	
Overheads	<u>900</u>	<u>2,400</u>
Profits		<u>600</u>

For the year 2008, the following are expected:

- (i) *Reduction in the selling price by 10%.*
- (ii) *Increase in the quantity sold by 50%.*
- (iii) *Inflation of direct material cost by 8%.*
- (iv) *Price inflation in variable overhead by 6%.*
- (v) *Reduction of fixed overhead expenses by 25%.*

It is also known that:

- (a) *In 2006, overhead expenditure totalled to Rs. 8,00,000.*
- (b) *Total overhead cost inflation for 2007 has been 5% more than 2006.*

Advanced Management Accounting

(c) Production and sales volumes have been 25% higher in 2007 than in 2006.
The high-low method is being used by the company to estimate overhead expenditure.
You are required to:

- Prepare a statement showing the estimated trading results for 2008.
- Calculate the Break-even point for 2007 and 2008.
- Comment on the BEP and profits of the years 2007 and 2008.

Answer

(a) (i)		Trading Results		Figures Rs. '000
	2006	2007	2008	Workings
Sales:		3,000	4,050	$(3,000 \times 1.5 \times .9)$
		(Refer to Note 1)		
Direct Material		900	1,458	$(900 \times 1.5 \times 1.08)$
Direct Labour		600	900	$(600 \times 1.5 \times 1)$
Variable Overhead		<u>300*</u>	<u>477</u>	$(300 \times 1.06 \times 1.5)$
		(Refer Note 2)		
Total Variable Cost		<u>1,800</u>	<u>2,835</u>	Total variable cost
Contribution		1,200	1,215	
Fixed Overhead		600	450	$(600 \times .75)$
		(Refer to Note 3)		
Total Overhead	800	<u>900</u>	<u>927</u>	
Total Cost		2,400	3,285	
Profits		600	765	
(ii) P/V Ratio	Contribution/ Sales	40%	30%	
BEP Fixed Cost/PV Ratio		$\frac{600}{40\%} = 1,500$	$\frac{450}{30\%} = 1,500$	

(Note 1) $3,000 \times 1.5 \times 0.9$

(Note 2) Overhead Cost in 2006 = 800

Increase in price = 5%

∴ Overhead cost for same production $800 \times 5\% + 800 = 840$.

Overhead increase due to quantity = $900 - 840 = \text{Rs. } 60$

Rs. 60 represents increase in variable Overhead in 2007 due to increase in quantity by 25%.

∴ Variable Overhead amount in 2007 = $1\frac{1}{4}$ times

i.e. $\frac{5}{4} = 5 \text{ times } \left(\frac{1}{4} \text{ th quantity}\right) = 5 \times 60 = 300$

(Note 3)

In 2007 Total Overhead	900
Variable Overhead (Refer to Note 2)	<u>300</u>
Fixed Overhead	<u>600</u>

(iii)

	2007	2008	Difference	%
BEP	1,500	1,500	0	
Fixed Overhead	600	450	150	25%
PV Ratio	40%	30%	10%	25% $\frac{10}{40}$
Profit	600	765	165	27.5%

$$\text{BEP} = \frac{\text{Fixed Cost}}{\text{P/V ratio}}$$

Both Fixed Cost and P/V ratio have declined by 25% equally. So BEP sales remains the same.

The contribution is only Rs. 1,215 in 2008 though quantity is increased by 50%. This is due to increase in production cost and decrease in selling price. This is more than made up by decrease in fixed cost so that overall profit has increased by 27.5%.

Advanced Management Accounting

Alternative Solution (for identifying variability and fixedness of overheads):

$$V_1 q_1 = \text{Variable Overhead / unit in 2007} \times \text{quantity in 2007}$$

$$V_2 q_2 = \text{Variable Overhead / unit in 2008} \times \text{quantity in 2008}$$

$$V_2 q_2 = V_1 (1.06) (1.5) q_1 = 1.59 V_1 q_1$$

$$V_0 q_0 + F_0 = 800$$

$$V_1 q_0 + F_0 = \underline{840} \text{ where } q_0 \times 1.25 = q_1$$

$$V_1 q_0 - V_0 q_0 = 40$$

$$V_0 q_0 = V_1 q_0 - 40$$

$$V_1 q_0 + F_1 - (V_0 q_0 + F_0) = \frac{5}{100} \times 800 = 40$$

$$\text{i.e. } V_1 q_0 + F_1 = 840$$

$$V_1 q_1 + F_1 = \underline{900}$$

$$V_1 (q_0 - q_1) = -60$$

$$V_1 (q_1 - 1.25 q_0) = -60 \times 1.25$$

$$V_1 (-.25) q_1 = -75$$

$$V_1 q_1 = \frac{-75}{-.25} = 300$$

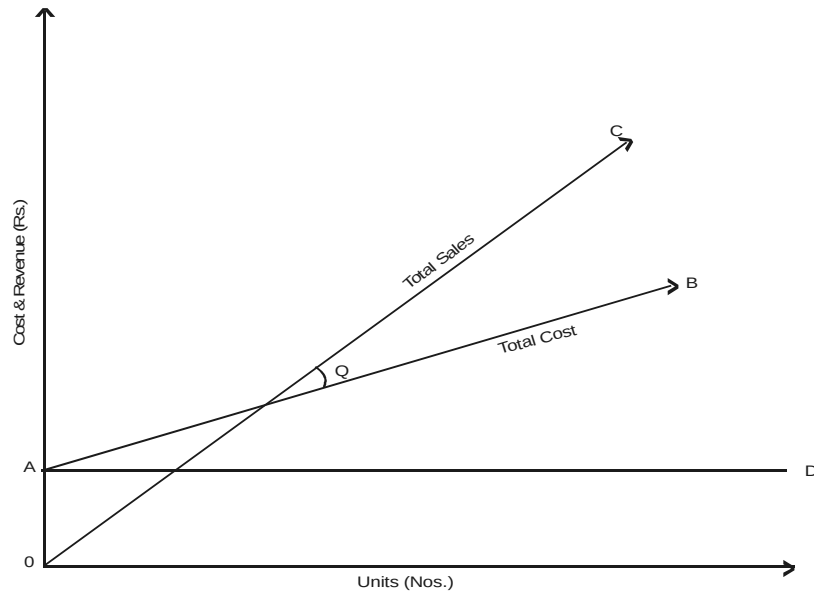
Year 2007	Variable Overhead	300
	Fixed Overhead	<u>600</u>
		900

Question 12

Draw and explain the angle of incidence in a break-even chart. What is its significance to the management?

Answer

(c)



Angle of incidence (0) is the angle between the total cost line and the total sales line.

If the angle is large, the firm is said to make profits at a high rate and vice-versa.

A high angle of incidence and a high margin of safety indicate sound business conditions.

Question 13

A single product manufacturing company has an installed capacity of 3,00,000 units per annum. The normal capacity utilization of the company is 90%. The company has prepared the following budget for a year:

Variable costs:

Factory costs	Rs. 33 per unit
---------------	-----------------

Selling and Administration costs	Rs. 9 per unit
----------------------------------	----------------

Fixed costs:

Factory costs	Rs. 21,60,000
---------------	---------------

Selling and Administration costs	Rs. 7,56,000
----------------------------------	--------------

Selling Price

Selling price per unit	Rs. 60
------------------------	--------

Advanced Management Accounting

The actual production, sales, price and cost data relating to the year under review are as given below:

Production	2,40,000 units
Sales	2,25,000 units
Finished goods stock in the beginning of the year:	15,000 units
Actual factory variable costs exceeded the budget by	Rs. 1,20,000

Required:

- Calculate the budgeted profit and break-even point in units.
- What increase in selling price was necessary during the year under review to maintain the budgeted profit?
- Prepare statements showing the actual profit during the year under review by using (1) absorption costing method and (2) marginal costing method.

Answer

- (i) **Contribution per unit:**

	Rs.	Rs.
Selling price per unit		60
Variable costs per unit:		
Factory	33	
Selling & Administration	<u>9</u>	<u>42</u>
Contribution per unit (Selling price – Variable cost)		<u>18</u>

Budgeted Profit:

	Units	Rs.	Rs.
Installed capacity	3,00,000		
Normal capacity utilization (3,00,000 × 90%)	2,70,000		
Total contribution (A) (Contribution per unit × Normal capacity utilization) (2,70,000 × 18)			48,60,000
Fixed Costs (B)			
Factory Costs		21,60,000	
Selling and Administration costs		<u>7,56,000</u>	<u>29,16,000</u>
Profit (A – B)			<u>19,44,000</u>

$$\text{Break - even point (in units)} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

$$= \frac{29,16,000}{18} = 1,62,000.$$

(ii)	1.	Actual variable costs per unit	<i>Rs.</i>	<i>Rs.</i>
		Budgeted factory costs	33	
		Increase in Factory costs per unit		
		$\left(\frac{1,20,000}{2,40,000} \right)$	<u>0.50</u>	33.50
		Selling and Administration costs		<u>9.00</u>
				<u>42.50</u>
	2.	Selling price required to maintain the budgeted profit:		
	A.	Total contribution required (Rs.)		48,60,000
	B.	Actual production (units)		2,40,000
	C.	Contribution desired per unit (A ÷ B) (Rs.)		20.25
	D.	Variable cost per unit (Rs.)		42.50
	E.	Selling price required to maintain budgeted profit (C + D) (Rs.)		62.75
	F.	Increase in selling price necessary Rs. (62.75 – 60)		2.75

(iii) **Fixed overhead recovery rate:**

Fixed factory overheads	Rs. 21,60,000
Normal Production	2,70,000 units
Absorption Rate per unit : 21,60,000 / 2,70,000 = Rs. 8	

Stock analysis:

	Units
Opening stocks	15,000
Add: Production	2,40,000
Total	2,55,000
Less: Sales	2,25,000
Closing stocks	30,000

Advanced Management Accounting

1. Profitability based on Absorption Costing Method:

	Rs.	Rs.
A. Sales (2,25,000 units @ Rs. 60)		<u>1,35,00,000</u>
B. Production costs:		
Variable factory cost: (2,40,000 units × Rs. 33)	79,20,000	
Increase in cost	1,20,000	
Fixed factory costs (2,40,000 units × Rs. 8)	<u>19,20,000</u>	
Total production costs	99,60,000	
Less: Closing stock		
(30,000 units × 99,60,000) / 2,40,000	<u>12,45,000</u>	
	87,15,000	
Add: Opening stock 15,000 units × Rs. 41*	<u>6,15,000</u>	
Production cost of goods sold		93,30,000
C. Selling and Administration Costs:		
Variable costs: 2,25,000 units × Rs. 9	20,25,000	
Fixed Costs	<u>7,56,000</u>	<u>27,81,000</u>
D. Less: Total cost of goods sold (B + C)		<u>1,21,11,000</u>
		13,89,000
Less: Under absorption of factory fixed overheads		
(2,40,000 – 2,70,000 units) × Rs. 8		<u>2,40,000</u>
Profit		<u>11,49,000</u>
Cost of opening stock (per unit)	= Variable Factory cost + Fixed overhead recovery rate	
	= Rs. 33 per unit + Rs. 8 per unit	
	= Rs. 41 per unit.	

Profitability based on Marginal Costing Method:

	Rs.	Rs.
A Sales (2,25,000 units @ Rs. 60)		<u>1,35,00,000</u>
Production variable costs:		
Variable cost (2,40,000 units × Rs. 33)	79,20,000	

CVP Analysis & Decision Making

	Increase in cost	<u>1,20,000</u>	
	Total	80,40,000	
	Less: Closing stock:		
	(30,000 × 80,40,000) / 2,40,000	<u>10,05,000</u>	
		70,35,000	
	Add: Opening Stock (15,000 units × Rs. 33)	<u>4,95,000</u>	
B	Production variable cost of goods sold	75,30,000	
C	Variable Selling & Administrative Expenses (2,25,000 × Rs. 9)	20,25,000	
D	Total variable costs (B + C)		<u>95,55,000</u>
E	Contribution (A – D)		39,45,000
F	Less: Fixed overheads: Factory	21,60,000	
	Selling & Administration	<u>7,56,000</u>	<u>29,16,000</u>
G	Profit (E – F)		<u>10,29,000</u>

Question 14

Bloom Ltd. makes 3 products, A, B and C. The following information is available:

(Figures in Rupees per unit)

	A	B	C
Selling price (peak-season)	550	630	690
Selling price (off-season)	550	604	690
Material cost	230	260	290
Labour (peak-season)	110	120	150
Labour (off-season)	100	99	149
Variable production overhead	100	120	130
Variable selling overhead (only for peak-season)	10	20	15
Labour hours required for one unit of production	8	11	7 (hours)

Material cost and variable production overheads are the same for the peak-season and off-season. Variable selling overheads are not incurred in the off-season. Fixed costs amount to Rs. 26,780 for each season, of which Rs. 2,000 is towards salary for special

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technician, incurred only for product B, and Rs. 4,780 is the amount that will be incurred on after-sales warranty and free maintenance of only product C, to match competition.

Labour force can be interchangeably used for all the products. During peak-season, there is labour shortage and the maximum labour hours available are 1,617 hours. During off-season, labour is freely available, but demand is limited to 100 units of A, 115 units of B and 135 units of C, with production facility being limited to 215 units for A, B and C put together.

You are required to:

- (i) Advise the company about the best product mix during peak-season for maximum profit.
- (ii) What will be the maximum profit for the off-season?

Answer

(a)

Bloom Ltd.

Peak Season.

Statement of Contribution and BEP (in units)

Figures Rs.

Product	A	B	C
A. Selling Price per unit	<u>550</u>	<u>630</u>	<u>690</u>
Variable Costs per unit:			
Direct Material	230	260	290
Direct Labour	110	120	150
Variable Overhead – Production	100	120	130
Variable Overhead-Selling	<u>10</u>	<u>20</u>	<u>15</u>
B. Total Variable Cost	450	520	585
C. Contribution / unit (A – B)	100	110	105
D. Direct Labour hours / required per unit	8	11	7
E. Contribution per Labour Hour (C / D)	12.5	10	15
F. Ranking	2	3	1
General Fixed Overhead			20,000

CVP Analysis & Decision Making

Specific Fixed overhead	2,000	4,780	<u>6,780</u>
G. Total Fixed Overhead			26,780
H. BEP (units) (for only 1 Product at a time) (G/C)	$\frac{20,000}{100} = 200$	$\frac{22,000}{110} = 200$	$\frac{24,780}{105} = 235$

Maximum units that can be produced of product C with limited labour hours 1,617.

$$= \frac{1,617}{7} = 231.$$

231 < Break Even units.

Hence, Bloom Ltd. cannot produce C.

Next rank = A

Maximum units of A that can be produced with limited labour hours = $\frac{1,617}{8} = 202$ units.

Break Even units of A = 200

∴ Profit if only A is produced

	Rs.
Contribution = Rs. 202 × 100	20,200
Fixed Cost	<u>20,000</u>
Profit	<u>200</u>

Off Season

Bloom Ltd.

Off Season

Statement of Contribution and demand

		<i>Figures Rs. per unit</i>		
	Product	A	B	C
A	Selling Price	550	604	690
	Direct Material	230	260	290
	Direct Labour	100	99	149
	Production-Variable Overhead	<u>100</u>	<u>120</u>	<u>130</u>

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B	Total Variable Cost	430	479	569
C	Contribution per unit (A – B)	120	125	121
	Ranking	3	1	2
	Maximum demand	100	115	135
	Overall limit of production			215 units

Statement of profitability under different options

(limit of production = 215 units)

	A	B	C	Total	Fixed Cost	Profit (loss)
Contribution per unit	120	125	121	-		
Option 1: Units	-	115	100	215		
Contribution (Rs.)	-	14,375	12,100	26,475	26,780	(305)
Option 2: Units	100	115	-	215		
Contribution (Rs.)	12,000	14,375	-	26,375	22,000	4,375
Option 3: Units	80	-	135	215		
Contribution (Rs.)	9,600	-	16,335	25,935	24,780	1,155

Best strategy is to produce 100 units of product A and 115 units of product B during off-season.

Maximum profit = Rs. 4,375.

- (i) Best strategy for peak-season is to produce 202 units of A.
- (ii) Maximum profit for off-season Rs. 4,375.

Question 15

A company has prepared the following budget for the forthcoming year:

	Rs. lakhs
Sales	20.00
Direct materials	3.60
Direct labour	6.40
Factory overheads:	
Variable	2.20

CVP Analysis & Decision Making

<i>Fixed</i>	2.60
<i>Administration overheads</i>	1.80
<i>Sales commission</i>	1.00
<i>Fixed selling overheads</i>	<u>0.40</u>
<i>Total costs</i>	<u>18.00</u>
<i>Profit</i>	<u>2.00</u>

The policy of the company in fixing selling prices is to charge all overheads other than the prime costs on the basis of percentage of direct wages and to add a mark up of one-ninth of total costs for profit.

While the company is confident of achieving the budget drawn up as above, a new customer approached the company directly for execution of a special order. The direct materials and direct labour costs of the special order are estimated respectively at Rs. 36,000 and Rs. 64,000. This special order is in excess of the budgeted sales as envisaged above. The company submitted a quotation of Rs. 2,00,000 for the special order based on its policy. The new customer is willing to pay a price of Rs. 1,50,000 for the special order. The company is hesitant to accept the order below total cost as, according to the company management, it will lead to a loss.

You are required to state your arguments and advise the management on the acceptance of the special order.

Answer

Analysis of Cost and profit:

	Rs. (lakhs)	Rs. (lakhs)
Direct material	3.60	
Direct labour	<u>6.40</u>	
Prime cost		10.00
Overhead:		
Variable factory overhead	2.20	
Fixed factory overhead	2.60	
Administration overheads	1.80	
Selling commission	1.00	
Fixed selling overheads	<u>0.40</u>	<u>8.00</u>
Total cost		18.00

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Profit 2.00

Rate of profit on costs $(2/18) = 1/9$

Overhead absorption rate based on direct wages = $(8.00 / 6.40) \times 100 = 125\%$ of direct wages

Break up of new order:	<i>Rs.</i>
Direct Materials	36,000
Direct Labour	64,000
Overheads 125% of direct wages	80,000
Total costs	1,80,000
Profit 1/9	20,000
Selling Price	2,00,000

The following points emerge:

- (i) Factory overheads only are to be recovered on the basis of direct wages.
- (ii) The special order is a direct order. Hence commission is not payable.
- (iii) The budgeted sales are achieved. Hence all fixed overheads are recovered. Hence, no fixed overheads will be chargeable to the special order.

Based on the above, the factory variable overheads recovery rate may be calculated as under:

Total variable factory overheads	Rs. 2.20 lakhs
Direct wages	Rs. 6.40 lakhs
Factory overhead rate = $(2.20 / 6.40) \times 100 = 34.375\%$	

Applying this rate the cost of the special order will be as under:

	<i>Rs.</i>
Direct materials	36,000
Direct labour	64,000
Overheads 34.375% of direct wages	22,000
Total costs	1,22,000
Price offered	1,50,000
Margin	28,000 (more than 1/9)

Hence, the order is acceptable at the price of Rs. 1,50,000.

Question 16

Paints Ltd. manufactures 2,00,000 tins of paint at normal capacity. It incurs the following manufacturing costs per unit:

	Rs.
Direct material	7.80
Direct labour	2.10
Variable overhead	2.50
Fixed overhead	<u>4.00</u>
Production cost / unit	<u>16.40</u>

Each unit is sold for Rs. 21, with an additional variable selling overhead incurred at Rs. 0.60 per unit.

During the next quarter, only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to Rs. 74,000 for the quarter.

When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shut down for the quarter are estimated at Rs. 14,000.

You are required:

- To advise whether it is more economical to shut down the plant during the quarter rather than operate the plant.*
- Calculate the shut down point for the quarter in terms of numbering units.*

Answer

$$\begin{aligned}
 \text{Contribution per tin} &= \text{Selling Price} - \text{Variable cost} \\
 &= 21 - (7.8 + 2.1 + 2.5 + 0.6) \\
 &= \text{Rs. 8 per tin.}
 \end{aligned}$$

Loss on operation:

$$\text{Fixed cost per annum} = 2,00,000 \text{ units} \times 4 \text{ per unit} = 8 \text{ lakhs.}$$

$$\therefore \text{Fixed cost for 1 quarter} = \frac{8}{4} = 2 \text{ lakhs}$$

Advanced Management Accounting

	Rs.
Fixed cost for the quarter	2,00,000
Less: Contribution on operation ($8 \times 10,000$)	<u>80,000</u>
Expected loss on operation	<u>(1,20,000)</u>

Loss on shut down:

	Rs.
Unavoidable Fixed Cost	74,000
Additional shut down cost	<u>14,000</u>
Loss on shut-down	<u>(88,000)</u>

Conclusion: Better to shut down and save Rs. 32,000.

$$\begin{aligned}\text{Shut-down point (number of units)} &= \frac{\text{Avoidable Fixed Cost}}{\text{Contribution per unit}} \\ &= \frac{2,00,000 - 88,000}{8} \\ &= \frac{1,12,000}{8} = 14,000 \text{ units.}\end{aligned}$$

Question 17

XYZ Ltd. has two divisions, A and B. Division A makes and sells product A, which can be sold outside as well as be used by B. A has a limitation on production capacity, that only 1,200 units can pass through its machining operations in one month. On an average, about 10% of the units that A produces are defective. It may be assumed that out of each lot that A supplies, 10% are defectives. (12 Marks)

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

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

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

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

The outside demand can be freely had upto 900 units.

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

- (i) *Evaluation of the best strategy for A in the present condition.*
- (ii) *If B can buy only upto 540 units and the outside demand is only 600 units, how much should A charge B to maintain the same level of profit as in (i) above?*

Answer

- (i) Contribution per unit against sale to outside = Rs (200-120-20) = Rs 60
 In case of transfer, good units and rejected units are in proportion of 9:1
 In case of transfer, contribution per good unit = Rs (190 – 120) = Rs 70
 In case of transfer, contribution per rejected unit = Rs (150 – 120-100) = Rs -70
 Thus, effective contribution per unit of transfer = Rs (70 x 0.9 – 70x 0.1) = Rs 56
 As contribution per unit against outside sale is higher, the best strategy should be to sell maximum number of unit to outside marker.

Contribution from outside market from sale of 900 units	=	Rs 54,000
		Rs.(900 x 60)
Contribution from transfer of 300 units to B	=	Rs 16,800
		Rs (300 x 56)
Total Contribution from best strategy	=	Rs 70,800
- (ii) If B's demand is 540 unit, total production required = 600 units.

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(540 / 0.9)

Taking outside market demand of 600, it is within production capacity of 1200 units.

Now contribution from 600 units of outside sale = Rs 36,000
Rs (600 x 60)

Contribution from rejected 60 units = Rs (4,200)
Rs (60 x – 70)
= Rs 31,800

To keep same level of contribution as in (i), the contribution required from transfer of 540 unit to B = Rs 39,000

(Rs 70,800 – 31,800)

Thus, contribution required per unit = Rs 72.22

Rs 39,000 / 540

Hence price to be charged per unit against transfer to B = Rs 192.2

Rs (120 + 72.22)

Alternative Solution:

Let x be the number of units sold outside and y be the number of units sold to B, before B returns 10% as defectives.

Then, $x + y = 1,200$, is the limitation on production capacity of A.

	Department A	
	Outside	to B
	Rs.	Rs.
Selling Prices	200	190
Variable Cost – Production	120	120
Variable Cost – Sale	<u>20</u>	<u>--</u>
Total Variable Cost	<u>140</u>	<u>120</u>
Contribution	60	70

Contribution on x units sold outside = $60x$

Out of y units to B, $10\% = \frac{1}{10}y = .1y$ is returned to A. If A scraps, amount got = 30 per unit.

If A reworks and sells, it gets $150 - 100 = 50$ / unit.

∴ Decision to reworks all defectives. i.e. (.1) (y)

Contribution on good units of B = $0.9y \times 70 = 63y$

Contribution on reworked units of B = $(.1) (y) \times 50 = 5y$

Amount of material lost on manufacture of defectives to B = $12y$

$(.1) (y) \times 120$

∴ Contribution on y gross units transferred to B = $56y$

$63y + 5y - 12y$

Total contribution earned by A = $60x + 56y$

where $x + y = 1200$

To maximize contribution, maximize units sold outside.

∴ 900 units – sell outside.

Balance $\frac{300}{1200}$ units (gross transfer to B, of which B gives back 30 defectives)

Contribution : Rs.60 (900) + Rs.56 (300)
 = Rs.54,000 + Rs.16,800

Contribution = Rs.70,800

Fixed Cost = Rs.36,000

(i) Profit = Rs.34,800

(ii) Outside demand = 600 units

Contribution = $600 \times \text{Rs.60} = \text{Rs.36,000}$

Balance to be got = Rs.34,800

= Rs.70,800

Out of Rs.34,800, defectives of B will give

Rs. 3,000 60×50

Rs. 31,800 charge to B for 540 units

Contribution to be obtained from 540 units of B = Rs. 31,800

Add: Production cost of 600 units @ 120/- = Rs. 72,000

Amount charged for 540 units = Rs. 1,03,800

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$$\therefore \text{Price to be charged to B} = \frac{1,03,800}{540} = 192.22$$

Per good unit transferred, to maintain the same level of profit as in (a).

Question 18

Ret Ltd., a retail store buys computers from Comp Ltd. and sells them in retail. Comp Ltd. pays Ret Ltd. a commission of 10% on the selling price at which Ret sells to the outside market. This commission is paid at the end of the month in which Ret Ltd. submits a bill for the commission. Ret Ltd. sells the computers to its customers at its store at Rs.30,000 per piece. Comp Ltd. has a policy of not taking back computers once dispatched from its factory. Comp Ltd. sells a minimum of 100 computers to its customers.

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

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

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

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

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

You are required to:

- (i) State what is Ret's best strategy along with supporting calculations.*
- (ii) Compute the break-even point in units, considering only the above costs.*

Answer

	Order Qty 100-140 (Rs.)	Order Qty 141-200 (Rs.)
Selling Price Rs./u	30,000	30,000
Commission @ 10%	3,000	3,000
Sales revenue p. u.	33,000	33,000

CVP Analysis & Decision Making

Less: Variable purchase cost	29,000	26,000
Contribution / unit (before shipping)	4,000	7,000
Less: Shipping cost > 110 units		5,000
Contribution/ units after Shipping		2,000

- (i) Upto 110 units, Reference will earn a contribution of Rs.4,000/u.
- (ii) Between 110 & 140 units, contribution of 4,000 will be wiped out by 5,000 on shipping costs. Hence we should not consider 110 – 140 range.
- (iii) 101 – 110 not to be considered since additional fixed costs 2,25,000 will not be covered by 10 units.
- (iv) Valid consideration, 100 units or 141 to 190 units.

Fixed cost of box of 50 cameras is Rs. 2,25,000

Units		100	141	150	190
No. of Camera Boxes	A	2	3	3	4
Cost of Cameras (Rs.)	B	4,50,000	6,75,000	6,75,000	9,00,000
Contribution (Rs/u) Rs. 4,000	C	400,000			
Contribution (Rs.) first 110 units @ 7,000/u	D		7,70,000	7,70,000	7,70,000
Contribution (Rs.) Balance units @ 2,000/u	E		62,000	80,000	1,60,000
Total Contribution (F = C + D + E) (Rs.)	F	4,00,000	8,32,000	8,50,000	9,30,000
Profit (F) – (B) (Rs.)	G	- 50,000	1,57,000	1,75,000	30,000

Best strategy buy 150 units from Comp. sell 110 at store and 40 outside.

BEP should be between 151 – 191 units

Extra Camera box cost beyond 150 units = 2,25,000

Less: Profit for 150 units = 1,75,000

Extra profit acquired = 50,000

No. of units to cover this additional costs at contribution 2000 Rs./u = $\frac{50,000}{2,000} = 25$

∴ BEP = 150 + 25 = 175 units

Advanced Management Accounting

Alternative Solution to (ii)

The problem involves fixed cost of 50 Computers i.e Rs 2,25,000 for incremental sale of 50.

	Units sold			
	110	140	150	190
Margin per unit = Sales price – buying price + commission (Rs)	4000	4000	7000	7000
Margin (Excluding shipping cost)	4,40,000	5,60,000	10,50,000	13,30,000
Shipping cost (Rs)		30 x 5000	40 x 5000	80 x 5000
For sale beyond 110 units		= 1,50,00	= 2,00,000	= 4,00,000
Contribution (Rs)	4,40,000	4,10,000	8,50,000	9,30,000
Fixed cost (Cost of Computers)	6,75,000	6,75,000	6,75,000	9,00,000
Profit	-2,75,000	-2,65,000	1,75,000	30,000

Best strategy is sales level at 150 units.

The variations of profit is due to incremental fixed cost.

From the profits at different levels, it is seen that the BEP lies between 151 and 190.

Let BEP = X Units

Margin = 7000 X

Shipping Cost = (X -110)x 5000

Cost of Computers = Rs 9,00,000

We have, 7000 X = (X -110) x 5000 + 900000

Or 7X = 5X – 550 +900

Or 2X = 350 or X = 175

Thus, BEP = 175 units.

Question 19

Lee Electronic manufactures four types of electronic products, A,B,C and D. All these products have a good demand in the market. The following figures are given to you:

	A	B	C	D
Material cost (Rs./u)	64	72	45	56
Machining Cost (Rs/u @ Rs. 8 per hour)	48	32	64	24
Other variable costs (Rs/u)	32	36	44	20

CVP Analysis & Decision Making

Selling Price (Rs/u)	162	156	173	118
Market Demand (Units)	52,000	48,500	26,500	30,000

Fixed overhead at different levels of operation are :

Level of operation (in production hours)	Total fixed cost (Rs.)
Upto 1,50,000	10,00,000
1,50,000 – 30,00,000	10,50,000
3,00,000 – 4,50,000	11,00,000
4,50,000- 6,00,000	11,50,000

At present, the available production capacity in the company is 4,98,000 machine hours. This capacity is not enough to meet the entire market demand and hence the production manager wants to increase the capacity. The company wants to retain the customers by meeting their demands through alternative ways. One alternative is to sub-contract a part of its production. The sub-contract offer received as under :

	A	B	C	D
Sub-contract Price (Rs./u)	146	126	155	108

The company seeks your advice in terms of products and quantities to be produced and/or sub-contracted, so as to achieve the maximum possible profit. You are required to also compute the profit expected from your suggestion.

Answer

Demand	52,000	48,500	26,500	30,000
	A	B	C	D
Direct Material	64	72	45	56
M/c	48	32	64	24
Other Variable Cost	<u>32</u>	<u>36</u>	<u>44</u>	<u>20</u>
Total Variable Cost	<u>144</u>	<u>140</u>	<u>153</u>	<u>100</u>
Selling Price	162	156	173	118
Contribution (Rs./u)	18	16	20	18
M/s Hours per unit	6	4	8	3
Contribution (Rs./ M/c hr.)	<u>3</u>	<u>4</u>	<u>2.5</u>	<u>6</u>
Ranking	III	II	IV	I

Advanced Management Accounting

Sub-Contract Cost Rs./u)	146	126	155	108
Contribution (Rs./u) on (Sub-Contract)	16	30	18	8

I Division: It is more profitable to sub-contract B, since contribution is higher sub-contract.

1st Level of Operations: 1,50,000 hours, Produce D as much as possible.

Hours required = 30,000 units × 3 = 90,000 hours

Balance hours available: 60,000 hours.

Produce the next best (i.e. A, Since B is better outsourced)

$$\frac{60,000 \text{ hrs}}{6 \text{ hrs/u}} = 10,000 \text{ units of A.}$$

1st Level of Operation:

		Contribution (units)	Contribution (Rs.)
A	Produce 10,000 units	18	1,80,000
A	Outsource 42,000 units	16	6,72,000
B	48,500 units		
	Outsource fully	30	14,55,000
C	26,500 units		
	Outsource fully	18	
D	30,000 units		
	Fully produce	18	5,40,000
	Total Contribution:		33,24,000
	Less: Fixed cost		10,00,000
	Net Gain		23,24,000

2nd Level of Operation:

Both A and C increase contribution by own manufacture only by Rs.2/- per unit. 1,50,000 hrs can produce 25,000 units of A.

∴ Contribution increases by 25,000 × 2 = 50,000

(Difference in Contribution sub-contract and own manufacturing) = 2

But increase in fixed Cost = 50,000

CVP Analysis & Decision Making

At the 2nd level of operation, the increase in contribution by own manufacturing is exactly set up by increase in fixed costs by Rs.50,000/-. It is a point of financial indifference, but other conditions like reliability or possibility of the sub-contractor increasing his price may be considered and decision may then be towards own manufacture.

3rd Level Additional: 1,50,000 hrs available

Unit of A that are needed = [52,000 – 25,000 (2nd Level) – 10,000 (1st Level)]

= 17,000 units × 6 hrs/u = 1,02,000 hrs.

Balance 48,000 hrs are available for C to produce 6,000 units.

Increase in Contribution over Level 1st or 2nd:

A: 17,000 × 2 = Rs.34,000

C: 6,000 × 2 = Rs.12,000

= Rs.46,000

Increase in fixed costs = Rs.50,000

Additional Loss = Rs. 4,000

4th Level Additional: 1,50,000 hrs can give $\frac{1,50,000}{8} = 18,750$ unit of C.

Increase in Contribution 18,750 × 2 = Rs. 37,500

Increase in Cost = (Rs. 50,000)

Level 3rd loss c/fd = (Rs. 4,000)

Level 1st profit will order by = (Rs. 16,500)

Advice: Do not expand capacities; sell maximum

No. of units by operating at 1,50,000 hrs. capacity (level 1st) and gain Rs.23,24,000.

Summary:

Product	Produce (Units)	Sub-Contract (Units)	Contribution (Production)	Contribution (Sub-Contract)	Total Contribution
A	10,000	42,000	1,80,000	6,72,000	8,52,000
B	-	48,500	-	14,55,000	14,55,000
C	-	26,500	-	4,77,000	4,77,000
D	30,000	-	5,40,000	-	5,40,000

Advanced Management Accounting

	33,24,000
Fixed Cost	10,00,000
Profit	23,24,000

Question 20

TQM Limited makes engines for motor cars for its parent company and for two other motor car manufacturers.

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

The board of directors are currently considering following two options:

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

OR

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

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

	At 75% (Rs.)	At 25% (Rs.)	Idle (Rs.)
<i>Direct Material</i>	5,25,000	1,75,000	--
<i>Direct Labour</i>	5,23,600	1,73,250	--
<i>Factory overhead:</i>			
<i>Indirect material</i>	8,400	4,900	4,900
<i>Indirect labour</i>	1,01,500	59,500	--
<i>Indirect expenses:</i>			
<i>Repairs and maintenance</i>	28,000	28,000	--
<i>Others expenses</i>	52,500	34,300	26,600
<i>Office overheads:</i>			
<i>Staff salaries</i>	1,48,400	98,000	67,550
<i>Other overheads</i>	28,000	19,950	11,200

Other information is as follows:

- Material cost and labour cost will not be incurred where there is no production.
- On the reopening of the factory, one time cost of training and engagement of new personnel would be Rs.65,800 and overhauling cost of plant would be Rs.14,000.
- Parent company can purchase engines from open market at reasonable price.

Required:

- (i) To express your opinion, along with calculations, as to whether the plant should be shut down during the month of March and April or operate 25% of full capacity for three months.
- (ii) To list and comment on cost and non-costs factors which might be relevant to the discussion.

Answer

(i)

	Option I At 75% in Feb and close in March and April (Rs.)	Option II At 25% each from Feb – April (Rs.)
Direct Material	5,25,000	5,25,000
Direct Labour	5,23,600	5,19,750
	10,48,600	10,44,750
Factory Overhead :		
Indirect Material	8,400	14,700
Two months idle	9,800	
Indirect Labour	1,01,500	1,78,500
Training cost	65,800	
Indirect Exp. :		
Repairs & Maintenance	28,000	84,000
Over hauling cost	14,000	
Others Expenses	52,500	1,02,900
Idle × 2	53,200	
Office overhead:		

Advanced Management Accounting

Staff Salaries	1,48,400	2,94,000
Idle 67,550 × 2	1,35,100	
Other overheads	28,000	59,850
Idle	22,400	
Total overhead cost	6,67,100	7,33,950
Total cost	17,15,700	17,78,700

The more economic course of action is to operate at 75% capacity for a month only, and close the plant for March and April. This option will save (Rs.17,78,700 – Rs.17,15,700) = Rs.63,000.

(ii) Cost Factors and Non Cost Factors

In regard to the decision on close down of operations or continuing with operations, the factors to be considered are:

(a) Cost factors:

- (1) The proposal which involves the lower total costs will be selected.
- (2) If the company has contracted the purchases from high quality and high price suppliers, a change in the procurement policy to 'shop around' may be considered to obtain economics in purchases.
- (3) The services of unskilled labour, if any, who do not require re-training may be dispensed with. They may be recruited and put on work without incurring training cost on re-opening of the factory. This will save training and idle time cost.
- (4) The possibility of wage freeze may reluctantly be considered as an extreme measure.

Question 21

Fairbilt Furniture Ltd. manufactures three products: Tables, Chairs and Cabinets. The company is in the process of finalizing the plans for the coming year; hence the executives thought it would be prudent to have a look at the product-wise performance during the current year. The following information is furnished:

	Tables	Chairs	Cabinets
Unit selling price	80	60	36
Direct material	28	24	16
Direct labour	20	12	12

CVP Analysis & Decision Making

Factory overheads:			
Variable	8	6	4
Fixed	8	6	1.28
Cost of production	64	48	33.28
Selling, distribution and general administration expenses :			
Variable	4	2	2
Fixed	4	6	1.52
Unit cost (I)	72	56	36.80
Unit profit (loss) (II)	8	4	(0.80)
Sales volume (units)	10,000	15,000	15,000
Profit (loss)	80,000	60,000	(12,000)

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

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

Answer

Note: Reconciliation of the figures given for 'cabinets' reveals the fact that the selling price is 36(36.80 – .80)

Fairbilt Furniture Ltd.

Statement showing Product-wise Contribution and Total Profit

	Tables		Chairs		Cabinets		Total
	Per Unit	Total	Per unit	Total	Per unit	Total	
Sales volume (units)		10,000		15,000		15,000	
Selling price (Rs.)	<u>80</u>	<u>800,000</u>	<u>60</u>	<u>900,000</u>	<u>36</u>	<u>540,000</u>	<u>22,40,000</u>

Advanced Management Accounting

Direct Material	28	280,000	24	360,000	16	240,000	880,000
Direct Labour	20	200,000	12	180,000	12	180,000	560,000
Variable factory overheads	8	80,000	6	90,000	4	60,000	230,000
Variable selling, distribution and administration overhead	4	40,000	2	30,000	2	30,000	100,000
Total variable cost	60	600,000	44	660,000	34	510,000	1,770,000
Contribution	20	200,000	16	240,000	2	30,000	470,000
Fixed factory overheads		80,000		90,000		19,200	189,200
Fixed selling, distribution and administration overheads		40,000		90,000		22,800	152,800
Total fixed overheads							342,000
Total Profit							128,000

The above analysis shows the cabinets make a contribution of Rs.2 per unit. The loss sustained in the previous year is because of the falling sales volume below breakeven level.

Fairbilt Furniture Ltd.

Budgeted Performance for the Coming Year

	Tables	Chairs	Cabinets
Unit Contribution (Rs.)	20	16	2
Sales Volume (Units)	11,000	15,000	23,000
Total Contribution (Rs.)	220,000	240,000	40,000
Less: Fixed Cost (Rs.)	120,000	180,000	42,000
Profit (Rs.)	100,000	60,000	4,000

The company makes a total profit of Rs.164,000 if all the products are continued. However, if the production of cabinets is discontinued, there will be an adverse effect on

the overall profit of the company. This is because cabinets also contribute toward meeting the fixed costs of the company.

Question 22

An agro-products producer company is planning its production for next year. The following information is relating to the current year:

<i>Products/Corps</i>	<i>A1</i>	<i>A2</i>	<i>B1</i>	<i>B2</i>
<i>Area occupied (acres)</i>	250	200	300	250
<i>Yield per acre (ton)</i>	50	40	45	60
<i>Selling price per ton (Rs.)</i>	200	250	300	270
<i>Variable cost per acre (Rs.)</i>				
Seeds	300	250	450	400
Pesticides	150	200	300	250
Fertilizers	125	75	100	125
Cultivations	125	75	100	125
Direct wages	4,000	4,500	5,000	5,700

Fixed overhead per annum (Rs.) 53,76,000.

The land that is being used for the production of B1 and B2 can be used for either crop, but not for A1 and A2. The land that is being used for A1 and A2 can be used for either crop, but not for B1 and B2. In order to provide adequate market service, the company must produce each year t least 2,000 tons each of A1 and A2 and 1,800 tons each of B1 and B2.

You are required to:

- (i) Prepare a statement of the profit for the current year.*
- (ii) Profit for the production mix by fulfilling market commitment.*
- (iii) Assuming that the land could be cultivated to produce any of the four products and there was no market commitment, calculate: Profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value.*

Answer

- (i) Calculation of selling price and contribution per acre:**

<i>Products</i>	<i>A1</i>	<i>A2</i>	<i>B1</i>	<i>B2</i>	<i>Total</i>
Yield per acre in (tones)	50	40	45	60	
Selling price per tones (Rs.)	200	250	300	270	

Advanced Management Accounting

Sales revenue per acre (Rs.)	10,000	10,000	13,500	16,200	
Variable cost per acre (Rs.)	4,700	5,100	5,950	6,600	
Contribution per acre (Rs.)	5,300	4,900	7,550	9,600	
Area (acres)	2,50	200	300	250	
Total contribution (Rs.)	13,25,000	9,80,000	22,65,000	24,00,000	69,70,000
Less: Fixed Cost					53,76,000
Profit (Rs.)					15,94,000

(ii) Profit Statement for recommended mix

Products	A1	A2	B1	B2	Total
Contribution per acre	5300	4900	7550	9600	
Rank	1	2	2	1	
Minimum Sales Requirement in acres		2000/40 = 50	1800/45 = 40		
Recommended Mix (in Acres)	400	50	40	510	
Total Contribution (Rs.)	21,20,000	2,45,000	3,02,000	48,96,000	75,63,000
Less: Fixed Cost					53,76,000
Profit					21,87,000

(iii) Most profitable crop: Production should be concentrated on B2 which gives highest contribution per acres Rs.9,600.

Overall contribution if complete land is used for B2 (1,000 × 9,600) = Rs.96,00,000

Less: Fixed Cost = Rs.53,76,000

Profit: = Rs.42,24,000

Break even point in acres for B2 = 5376000 ÷ 9600 = 560 acres

Break even point in sales value = 560 × (270 × 60) = Rs.90, 72,000

Question 23

LMV Limited manufactures product Z in departments A and B which also manufacture other products using same plant and machinery. The information of product Z is as follows:

CVP Analysis & Decision Making

Items	Department A (Rs.)	Department B (Rs.)
Direct material per unit	30	25
Direct labour per unit (Rs.10 per hour)	30	40
Overhead rates:		
Fixed	8 per hour	4 per hour
Variable	6 per hour	3 per hour
Value of Plant and Machinery	25 lakhs	15 lakhs

Overheads are recovered on the basis of direct labour hours. Variable selling and distribution overheads relating to product Z are amounting to Rs.30, 000 per month. The product requires a working capital of Rs.4, 00,000 at the target volume of 1,500 units per month occupying 30 per cent of practical capacity.

You are required:

- (i) To calculate the price of product Z to yield a contribution to cover 21 percent rate of return on investment.
- (ii) Set the minimum selling price of the product if (1) the product is well established in the market; (2) the product is first time launched in the market.

Answer

- (i) Statement showing price of Product Z

Direct Material	Deptt. A	30	
	Deptt. B	<u>25</u>	55
Direct Labour	Deptt. A	30	
	Deptt. B	<u>40</u>	70
Variable overhead	Deptt. A 3×6	18	
	Deptt B 4×3	<u>12</u>	30
Variable selling and distribution overhead 30,000/1,500			20
Total Variable Cost per unit			<u>175</u>
Total hours required for a target of 1,500 units of product Z			
Deptt. A 1500 × 3			4500 hours
Deptt. B 1500 × 4			<u>6000 hours</u>
			<u>10500 hours</u>

Advanced Management Accounting

10500 hours represent 30% capacity

So total capacity per month $10500 / 0.30 = 35000$ hours.

Yearly capacity is $35000 \times 12 = 420000$ hours.

Fixed capital employed in both department = 40.00 Lakhs

(25 lakhs + 15 Lakhs)

Expected return = $0.21 \times 40,00,000 = 840000$

Contribution per hour = $840000 / 420000 = 2.00$ per hour

Working Capital = $0.21 \times 400000 = 84000$

Contribution per unit $84000 / 18000$ unit = 4.67 per unit

Total contribution required Rs.

To cover fixed cost 3 hours of A and 4 of B = $7 \times 2 = 14.00$

To working capital = 4.67

18.67

Fixed charges recovery is based on usage. Full capacity is not being used by product Z and departments are also producing other products using same plant and machinery. Price of Product = Variable cost + contribution required = $175 + 18.67 = 193.67$ per unit.

(ii) Price of product when product is well established in market:

Variable Cost 175

Fixed Cost (24 + 16) 40

Total price 215

The product is first time launched in the market, and then variable cost Rs.175 should form the basis for price fixation.

EXERCISE

Question 1

AB Ltd. Manufacture foam, carpets and upholstery in its three divisions. Its operating statement for 1995-96 showing the performance of these divisions drawn for the use of management is reproduced below:

(Rupees in '000)

	Manufacturing Divisions			Total
	Foam	Carpets	Upholstery	
Sales revenue	1,600 (A)	1,200	1,200	4,000
Manufacturing Costs Variable	1,200	700	680	2,580
Fixed (Traceable)	-	100	20	120
	1,200	800	700	2,700
Gross Profit	400	400	500	1,300
Expenses: Administration	134	116	172	422
Selling	202	210	232	644
	336	326	404	(B) 1,066
Net Income	64	74	96	234
Division's Ranking	3 rd	2 nd	1 st	-

- (A) Sales include foam transferred to the Upholstery division at its manufacturing cost Rs.2,00,000.
- (B) Common expenses of Rs.1,30,000 and Rs.1,00,000 on account of administration and selling respectively stand apportioned to these divisions at 10% of Gross Profit in case of administration and 2.5 % of Sales in case of selling expense. Rest of Rs.8,36,000 of the expense are traceable to respective divisions.

The manager of the foam division is not satisfied with the above approach of presenting operating performance. In his opinion his division is best among all the divisions. He requests the management for preparation of revised operating statement using contribution approach and showing internal transfer at market price.

You are required to:

- (a) Draw the revised operating Statement using contribution approach and pricing the internal transfer at market price.

Advanced Management Accounting

- (b) Compute relevant ratios to show comparative profitability of these division and rank them in the light of your answer at (a) above. Further, other your comments on the contention of the manager of foam division.
- (c) State why the contribution approach and pricing of internal transfer at market price are more appropriate in realistic assessment of the performance of various divisions.

Answer

	(Rs.'000)			
Divisions	Foam	Carpets	Upholstery	Total
(a) Contribution:	480	500	440	1,420
(b) Fixed Cost	256	356	344	956
(c) Net Income of the company				234

Question 2

K. Ltd. Manufactures and sells a range of sport goods. Management is considering a proposal for an advertising campaign, which would cost the company Rs.3,00,000. The marketing department has put forward the following two alternative sales budgets for the following year.

	Product ('000)			
	A	B	C	D
Budget 1 – Without Advertising	216	336	312	180
Budget – 2 With Advertising	240	372	342	198

Selling prices and variable production costs are budgeted as follow:

	Product (Rs. Per unit)			
	A	B	C	D
Selling prices	11.94	14.34	27.54	23.94
Variable Production Costs:				
Direct Material	5.04	6.60	15.24	12.48
Direct Labour	2.04	2.04	3.36	3.18
Variable overheads	0.72	0.72	1.20	1.08

Other Data:

- (1) *The variable overheads are absorbed on a machine hour basis at a rate of Rs.1.20 per machine hour.*
- (2) *Fixed overheads total Rs.30,84,000 per annum.*
- (3) *Production capacity during the budget period 8,15,000 machine hours.*
- (4) *Products A and C could be bought in at Rs.10.68 per unit and Rs.24 per unit respectively.*

Required:

- (i) *Determine whether investment in the advertising campaign would be worthwhile and how production facilities would be best utilised.*
- (ii) *Explain the assumptions and reasoning behind your advise.*

Answer

Statement of production facilities utilisation

<i>Product</i>	<i>Machine hours utilised</i>
A	1,44,000
B	2,23,200
C	2,69,600
D	1,78,000
Total	8,15,000

Question 3

You have been approached by a friend who is seeking your advice as to whether he should give up his job as an engineer, with a current salary of Rs.14,800 per month and go into business on his own, assembling and selling a component which he has invented. He can procure the parts required to manufacture the component from a supplier.

It is very difficult to forecast the sales potential of the component, but after some research, your friend has estimated the sales as follows:

- (i) *Between 600 to 900 components per month at a selling price of Rs.250 per component.*
- (ii) *Between 901 to 1,250 components per month at a selling price of Rs.220 component for the entire lot.*

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The cost of the parts required would be Rs.140 for each completed component. However if more than 1,000 components are produced in each month, a discount of 5% would be received from the supplier of parts on all purchases.

Assembly costs would be Rs.60,000 per month upto 750 components. Beyond this level of activity assembly costs would increase to Rs.70,000 per month.

Your friend has already spent Rs.30,000 on development, which he would write-off over the first five years of the venture.

Required:

- (i) Calculate for each of the possible sales levels at which your friend could expect to benefit by going into the venture on his own.
- (ii) Calculate the break-even point of the venture for each of the selling price.
- (iii) Advise your friend as to the viability of the venture.

Answer

It is not worthwhile to sell between 900 and 1,000 units when no discount is available. Also, it is worthwhile selling at Rs.220 if sales units are in excess of 1,000 units and a discount of 5% is available on the purchase of all components – parts.

Profit on the sale of 1,250 units = 1,250 units × Rs.87 – Rs.84,800 = Rs.23,950

Question 4

SWEET DREAMS LTD. Manufactures and markets three products A, Band C in the State of Haryana and Rajasthan. At the end of first half of 1996-97 the following absorption based profit statement has been drawn by the accountant:

	(Rs. in '000)		
	Haryana	Rajasthan	Total
Sales	3,000	900	3,900
Manufacturing Costs of Sales	<u>2,331</u>	<u>699</u>	<u>3,030</u>
Gross Profit	<u>699</u>	<u>201</u>	<u>870</u>
Administration Expenses (A)	120	36	156
Selling Expenses (B)	184	169	353
Total Expenses	<u>304</u>	<u>205</u>	<u>509</u>
Net Profit	<u>365</u>	<u>(-) 4</u>	<u>361</u>

- (A) The expenses are constant and common to both the States. They stand allocated on the basis of Sales.
- (B) The expenses are semi-fixed but specifically relate to the respective State.

The management is worried to note that the decision taken to market the products in Rajasthan to utilise idle capacity has proved wrong and wish to cover only Haryana State. The incharge marketing division is not satisfied with the above way of profit presentation. He is of the firm opinion that sales effected in the State of Rajasthan is contributing profits. For the next half year he expects no increase in demand in Haryana while for Rajasthan he anticipates to sell B or C more by 50% of existing sales. This will utilise the idle capacity in full.

The product-wise relevant details for the first half of 1996-97 are:

	A	B	C
Sales (in Rs.'000):			
Haryana	1,200	900	900
Rajasthan	300	300	300
Variable Costs (as a % on sales) :			
Manufacturing	40	35	30
Selling	3	2	2
Specific fixed manufacturing expenses (in Rs.'000)	570	470	610

You are required to:

- (a) Prepare s State-wise profit statement for the first half of 1996-97 using contribution approach. Also offer your views on the contention of the management and opinion expressed by incharge marketing division.
- (b) Prepare a product wise profit statement for the same period using contribution approach.
- (c) Submit your well thought out recommendation as to which product should be produced to utilise idle capacity.

Answer

	A	B	C	Total
P/V ratio (Contribution/Sales) × 100	57%	63%	68%	62.23%

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Recommendation for utilising idle capacity:

A review of the above P/V ratio's shows that the increase of output of product C in Rajasthan is the best. The increase of production after utilising the idle capacity in Rajasthan to the extent of Rs.1,50,000 (i.e. 50% of Rs.3,00,000) would increase the contribution of the company in the state of Rajasthan by Rs.1,02,000 (68% × Rs.1,50,000).

Question 5

The relevant data of X Ltd. For its three products A, B and C are as under:

	A	B	C
Direct Material (Rs./Unit)	260	300	250
Direct Labour (Rs./Unit)	130	270	260
Variable Overheads (Rs./Unit)	110	230	180
Selling Price (Rs./Unit)	860	1040	930
Machine Hours Required (per Unit)	12	6	3

The estimated fixed overheads at four different levels of 3,600; 6,000; 8,400 and 10,800 machine hours are Rs.1,00,000; Rs.1,50,000; Rs.2,20,000 and Rs.3,00,000 respectively. The maximum demand of A, B and C in a cost period are 500; 300 and 1,800 units respectively.

You are required to find out (i) the most profitable product-mix at each level and (ii) the level of activity where the profit would be maximum.

Answer

Product	A	B	C
Maximum demand in units	500	300	1,800

Recommendation:

At 8,400 machine hour level of capacity the company would earn maximum profit i.e. Rs.3,20,000.

* Refer to working note.

Question 6

Navbharat Commerce College, Bombay has six sections of B.Com, and two section of M.Com with 40 and 30 students per section respectively. The college plans one-day pleasure trip around the city for the students once in an academic session during winter break to visit park Zoo, planetarium and aquarium.

A transporter used to provide the required number of buses at a flat rate of Rs.700 per bus for the aforesaid purpose. In addition, a special permit fee of Rs.50 per bus is required to be deposited with city Municipal Corporation. Each bus is 52 seater. Two seats are reserved for teachers who accompany in each bus. Each teacher is paid daily allowance of Rs.100 for the day. No other costs in respect of teachers are relevant to the trip.

The approved caterers of the college supply breakfast, lunch and afternoon tea respectively at Rs.7; Rs.30 and Rs.3 per student.

No entrance fee is charged at the park. Entrance fees come to Rs.5 per the zoo and the aquarium. As regards planetarium the authorities charge block entrance fee as under for group of students of educational institutions depending upon the number of students in a group:

No. of students in a Group	Block Entrance Fee
Upto 100	200
101-200	300
201 & above	450

Cost of prizes to be awarded to the winner in different games being arranged in the park depend upon the strength of students in a trip. Cost of prizes to be distributed are:

No. of students in a Trip	Cost of Prizes
Rs.	
Upto 50	900
51-125	1,050
126-150	1,200
151-200	1,300
201-250	1,400
251 & above	1,500

To meet the above costs the college collects Rs.65 from each student who wish to join the trip. The college release subsidy of Rs.10 per student in the trip towards it.

You are required to:

- Prepare a tabulated statement showing total costs at the levels of 60, 120, 180, 240 and 300 students indicating each item of cost.
- Compute average cost per student at each of the above levels.

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- (c) Calculate the number of students to break even for the trip as the college suffered loss during the previous year despite 72% of the students having joined the trip.

Answer

(a)

No. of students	60	120	180	240	300
Total costs	5,850	9,600	13,500	17,400	21,150

(b)

No. of students:	60	120	180	240	300
Average cost (Rs.)	97.50	80	75	72.50	70.50

(c)

No. of students in the trip	51-100	101-125	126-150	151-200	201-250	251-300
No. of students to break even:	105	140	145	180	220	255

Question 7

A Company produces three products from an imported material. The Cost Structure per unit of the products are as under:

	Product		
	A	B	C
	Rs.	Rs.	Rs.
Sales Value	<u>200</u>	<u>300</u>	<u>250</u>
Direct Material	50	80	60
Direct Wages Rs.6 per hour	60	120	108
Variable Overheads	30	60	54

Out of Direct Material 80% is of the imported material @ Rs.10 per kg.

Prepare a statement showing comparative Profitability of the three products under the following scenarios.

- (i) Imported Material is in restricted supply.
(ii) Production Capacity is limiting factor.

- (iii) When maximum sales potential of products A and B are 1,000 units each and that of product 'C' is 500 units for specific requirement, availability of imported material is restricted 10,000 kgs per month, how the profit could be maximised?

Answer

Products	A	B	C
Contribution per kg (Rs.)	15	6.25	5.83
	4,000	3,600	2,400
No. of units	1,000	562	500

Question 8

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

The following information is available:

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

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

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

You are required to find out:

- (a) Rent chargeable for single and double room per day, so that there is a margin of safety of 20% on hire of rooms and that the rent for a double room should be kept at 120% of a single room.

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- (b) Evaluate the profitability of restaurant, sports centre and shopping arcade separately.

Answer

Rent per day of single room (in Rs.)	756 (approx.)
Rent per day of double room (in Rs.)	907 (approx.)
(b) Profitability of restaurant:	Rs. 99,50,000
Profitability of sports centre:	
	Rs.
Contribution of sports centre per day:	4,12,500
Profitability of shopping arcade:	Nil

Question 9

ACE Office Supplies Corporation retails two products – a standard and a deluxe version of a designer ball point pen. The budgeted income statement is as under :

	Standard	Deluxe	Total
Sales (in units)	1,50,000	50,000	2,00,000
	Rs.	Rs.	Rs.
Sales:			
@ Rs.20 per unit	30,00,000	-	-
At Rs.30 per unit	-	15,00,000	45,00,000
Variable Costs:			
At Rs.14 per unit	21,00,000	-	-
At Rs.18 per unit	-	<u>9,00,000</u>	<u>30,00,000</u>
Contribution	9,00,000	6,00,000	15,00,000
Fixed Costs			<u>12,00,000</u>
Profit			<u>3,00,000</u>

Required:

- (i) Calculate the breakeven point in units assuming that the planned sales mix is maintained.
- (ii) Calculate the breakeven point in units:
- (a) if only standard version is sold, and

- (b) if only deluxe version is sold.
- (iii) Suppose 2,00,000 units are sold, but only 20,000 units are of deluxe quality. Calculate the profit. Calculate the breakeven points if these relationships persist in the next accounting period. Compare your answer with the original plan and the answer in requirement (b). what is your major finding?

Answer

- (a) Break even point in units (if only Standard version is sold)
= 2,00,000 units
- (b) Break even point in units (if only Deluxe version is sold)
= 1,00,000 units

Major findings on comparing budgeted sales plan and original sales plan

Sales mix ratio of Standard and Deluxe	Unites to be sold at breakdown		Total units sold	Profit on the sale of 2,00,000 unit
	Standard	Deluxe		
3 : 1	1,20,000	40,000	1,60,000	3,00,000

Question 10

The details of the output presently available from a manufacturing department of Hitech Industries Ltd. Are as follows:

Average output per week 48,000 units from 160 employees

Saleable value of output Rs.6,00,000

Contribution made by the output towards fixed

Expenses and profit Rs.2,40,000

The Board of Directors plans to introduce more automation in the department at a capital cost of Rs.1,60,000. The effect of this will be to reduce the number of employees to 120, but to increase the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output the Board intends to offer a 1% increase in the piecework rate of one rupee per article for every 2% increase in average individual output achieved. To sell the increased output, it will be necessary to decrease the selling price by 4%.

Required:

Calculate the extra weekly contribution resulting from the proposed change and evaluate, for the Board's information, the worth of the project.

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Answer

- | | | |
|-----|---|-------------------|
| (a) | Proposed piece work rate | = Rs.130 per unit |
| (b) | Proposed sale price per unit | = Rs.12 |
| (c) | Present marginal cost (excluding wages) per unit. | = Rs.6.50 p.u. |

Question 11

Satish Enterprises are leading exporters of Kid's Toys. J Ltd. of U.S.A. have approached Satish Enterprises for Exporting a special toy named "Jumping Monkey". The order will be valid for next three years at 3,000 toys per month. The export price of the toy will be 84.

Cost data per toy is as follows:

	Rs.
Materials	60
Labour	25
Variable overheads	20
Primary packing of the toy	15

The toys will be packed in lots of 50 each. For this purpose a special box, which will contain the 50 toys will have to be purchased, cost being Rs.400 per box.

Satish Enterprises will also have to import a special machine for making the toys. The cost of the machine is Rs.24,00,000 and duty thereon will be at 12%. The machine will have an effective life of 3 years and depreciation is to be charged on straight-line method. Apart from depreciation, annual fixed overheads is estimated at Rs.4,00,000 for the first year with 6% increase in the second year. Fixed overheads are incurred uniformly over the year.

Assuming the average conversion rate to be Rs.50 per \$, you are required to:

- Prepare a monthly and yearly profitability statements for the first year and second year assuming the production at 3,000 today per month.*
- Compute a monthly and yearly break even units in respect of the first year.*
- In what contingency can there be a second break-even point for the month and for the year as a whole?*
- Have you any comments to offer on the above?*

Answer

- (b) (i) Profit Statement of M/s Satish Enterprises for first and second year on monthly and yearly basis.

	<i>First year</i>		<i>Second Year</i>	
	<i>Monthly Rs.</i>	<i>Yearly Rs.</i>	<i>Monthly Rs.</i>	<i>Yearly Rs.</i>
Profit	108	1,296	106	1,272

Question 12

“Cost is not the only criterion for deciding in favour of shut down” – Briefly explain.

Answer

Refer to Chapter 3: Paragraph 3.5

Question 13

M Company’s Central Services Department is evaluating new coping machines to replace the firm’s current copier, which is worn out. The analysis of alternative machines has been narrowed to three and the estimated costs of operating them are shown below:

	<i>Cost per 100 copies</i>		
	<i>Machine A</i>	<i>Machine B</i>	<i>Machine C</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
<i>Materials Cost</i>	60	40	20
<i>Labour Cost</i>	80	30	20
<i>Annual Lease Cost</i>	30,000	58,000	1,00,000

Required:

- (i) *Compute the cost indifference points for the three alternatives.*
- (ii) *What do the cost indifference points suggest as a course of action in this regard?*
- (iii) *If the management expects to need 87,000 copies next year which copier would be most economical?*

Answer

Cost indifference point for two machines viz.,

- (a) A & B = 400 Nos. (Multiple of 100 copies)
- (b) B & C = 1,400 Nos. (Multiple of 100 copies)
- (c) C & A = 700 Nos. (Multiple of 100 copies)
- (d) Hence from the above we conclude as follows:
From 0 to 400 Nos. (Multiple of 100 copies) use Machine A

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From 400 to 1,400 Nos. (Multiple of 100 copies) use Machine B

Above 1,400 Nos. (Multiple of 100 copies) use Machine C.

(e) machine B would be most economical.

Question 14

Somesh of Agra presently operates its plant at 80% of the normal capacity to manufacture a product only to meet the demand of Government of Tamil Nadu under a rate contract.

He supplies the product for Rs.4,00,000 and earns a profit margin of 20% on sales realisations Direct cost per unit is constant.

The indirect costs as per his budget projections are:

Indirect costs	20,000 units (80% capacity) Rs.	22,500 units (90% capacity) Rs.	25,000 units (100% capacity) Rs.
Variable	80,000	90,000	1,00,000
Semi-variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

He has received an export order for the product equal to 20% of its present operations. Additional packing charges on this order will be Rs.1,000.

Arrive at the price to be quoted for the export order to give him a profit margin of 10% on the export price.

Answer

Price to be quoted	Rs. 50,000
Export price per unit	Rs. 12.50

Question 15

ACE Ltd. has an inventory of 5,000 units of a product left over from last years' production. This model is no longer in demand. It is possible to sell these at reduced prices through the normal distribution channels. The other alternative is to ask someone to take them on "as is where is" basis. The latter alternative will cost the company Rs.5,000.

The company produced 2,40,000 units of the product, last year, when the unit costs were as under:

Manufacturing Costs:

Variable	6.00	
Fixed	1.00	7.00

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Selling & Distribution Cost:

Variable	3.00	
Fixed	1.50	4.50
Total Cost		11.50
Selling Price per Unit		14.00

Required:

Should the company scrap the items or sell them at a reduced price? If you suggest the latter, what minimum price would you recommend?

Answer

If the company can get anything more than Rs.2/- per unit, then it is worthwhile to sell the stock of 5,000 units and earn an additional contribution.