

2

Decision Making Using Cost Concepts and CVP Analysis

Question 1

Panchwati Cement Ltd. produces '43 grade' cement for which the company has an assured market. The output for 2004 has been budgeted at 1,80,000 units at 90% capacity utilisation. The cost sheet based on output (per unit) is as follows:

	₹
<i>Selling price</i>	130
<i>Direct material</i>	30
<i>Component 'EH'</i>	9.40
<i>Direct wages @ ₹ 7 per hour</i>	28
<i>Factory overhead (50% fixed)</i>	24
<i>Selling and distribution overheads (75% variable)</i>	16
<i>Administrative overhead (fixed)</i>	5

The factory overheads are applied on the basis of direct labour hours.

To utilise the idle capacity and to improve the profitability of the company, the following proposals were put up before the Board of Directors for consideration:

- (i) *An order has been received from abroad for 500 units of product '53 grade' cement per month at ₹ 175 per unit. The cost data are:*

Direct material ₹ 56 per unit, direct labour 10 hours per unit, selling and distribution overhead applicable to this product order is ₹ 14 per unit and variable factory overhead are chargeable on the basis of direct labour hours.

- (ii) *The company at present manufactures component 'EH', one unit of which is required for each unit of product '43 grade'. The cost details for 15,000 units of component 'EH' are as follows:*

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	₹
Direct materials	30,000
Direct labour	52,500
Variable overheads	25,500
Fixed overheads	<u>33,000</u>
Total	<u>1,41,000</u>

The component 'EH' however is available for purchase at the market at ₹ 7.90 per unit.

- (iii) In the event of company deciding to purchase the component 'EH' from market, the company has two alternatives for the use of the capacity so released, which are as under:
- (a) Rent out the released capacity at Re. 1 per hour.
- (b) Manufacture component 'GYP' which can be sold at ₹ 8 per unit. The cost data of this component for 15,000 units are:

	₹
Direct materials	42,000
Direct labour	31,500
Factory variable overheads	13,500
Other variable overheads	<u>25,500</u>
Total	- <u>1,12,500</u>

Required:

- (i) Prepare a statement showing profitability of the company envisaged in the budget.
- (ii) Evaluate the export order and state whether it is acceptable or not.
- (iii) Make an appraisal of proposal to manufacture component 'EH' and state whether the component 'EH' should be manufactured in the factory or purchased from the market. Assume that no alternative use of spare capacity is available.
- (iv) Evaluate the alternative use of the spare capacity and state whether to manufacture or buy the component 'EH' and if your decision is to buy the component 'EH', which of the two alternatives for the use of spare capacity will you prefer? (16 Marks)(Nov. 2004)

Answer

- (i) Profitability as per original Budget

		₹ ('000s)	₹ ('000s)
Sales(1,80,000 units × ₹ 130)	(A)		23,400
Direct Material (1,80,000 units × ₹ 30)		5,400	

Component 'EH' (variable cost = ₹ 7.20 per unit)		1,296	
Direct wages (1,80,000 units × ₹ 28)		5,040	
Variable factory overheads (1,80,000 units × ₹ 24 × 50%)		2,160	
Variable selling & distribution (1,80,000 units × ₹ 24 × 50%)		2,160	
Total variable cost	(B)		16,056
Contribution	(A – B)		7,344
Fixed factory overheads		2,160	
Fixed selling & distribution overheads		720	
Component 'EH' @2.20		396	
Administrative overhead		900	4,176
Profit			3,168

(ii) Export order

	₹ per Unit	₹ per Unit
Direct material	56	
Direct labour (10 hours × ₹ 7 per hour)	70	
Variable factory overhead (₹ 3 × 10 labour hours)	30	
Selling and distribution overheads	14	
Total variable cost		170
Selling price (export)		175
Contribution		5

Since the product earns contribution of ₹ 5 per unit, it should be accepted.

Total units 500(per month) = 6000 units(per annum)

Therefore additional contribution (6000 units × ₹ 5) = ₹ 30,000

Total hours on product '43 grade' (1,80,000 units × 4) = 7,20,000 Hrs

Total hours on component 'EH' (1,80,000 units × 0.5*) = 90,000 Hrs

* $\frac{\text{Direct Labour cost}}{\text{No of units produced} \times \text{Labour rate per hour}} = \frac{\text{₹ 52,500}}{15,000 \text{ units} \times \text{₹ 7 per hour}} = 0.5 \text{ Hrs}$

Total hours utilised at 90% capacity = 7,20,000 hours + 90,000 hours = 8,10,000 hours

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$$100\% \text{ capacity hours} = \frac{8,10,000 \text{ hours} \times 100}{90} = 9,00,000 \text{ Hrs}$$

Balance hours available = 90,000 hours p.a

Hours required for export order 60,000 hours.

Both contribution per unit of export order and availability of capacity confirm its acceptance.

(iii) Component 'EH' make or buy

(per 15,000 units)	Make (₹)	Buy (₹)
Direct material	30,000	
Direct labour	52,500	
Variable factory overhead	25,500	
Total	1,08,000	1,18,500
Per unit	7.20	7.90

If the company makes the component the out of pocket cost is ₹ 7.20 per unit whereas if the component is bought, the out of pocket cost is ₹ 7.90.

Decision : If the capacity remains idle it is profitable to make.

(iv) Alternative use of the spare capacity

Units required = 1,80,000 units and hours required = 1,80,000 × 0.5 = 90,000 Hrs

Cost of buying component 'EH' = (1,80,000 units × ₹ 7.90) = ₹ 14,22,000

Cost of making component 'EH' = (1,80,000 units × ₹ 7.20) = ₹ 12,96,000

Hence, excess cost of buying = ₹ 1,26,000

Rent income (90,000 hours × Re1) = ₹ 90,000

Contribution per unit from making component 'GYP' = ₹ 8 - $\frac{₹ 1,12,500}{15,000 \text{ Units}}$ = ₹ 0.5

per unit.

Direct labour cost per unit of 'GYP' = $\frac{₹ 31,500}{15,000 \text{ Units}}$ = ₹ 2.10 per unit.

No. of labour hours required for one unit of 'GYP' = $\frac{₹ 2.10}{₹ 7}$ = 0.3 Hrs

No. of units of 'GYP' in 90,000 hours = $\frac{90,000 \text{ hours}}{0.3 \text{ hours}}$ = 3,00,000

Contribution from component 'GYP' = 3,00,000 × ₹ 0.50 = ₹ 1,50,000

Since the contribution from 'GYP' is greater than the extra variable cost of buying component 'EH', component 'GYP' should be manufactured and component 'EH' should be purchased.

Question 2

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 ₹ 40 per unit. New price announced for 2005 is ₹ 100 per box. Variable cost on opening stock is ₹ 40 per box. You are required to compute breakeven volume for the year 2005. (7 Marks) (Nov. 2005)

Answer

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

In the question production of 2004 is same as in 2005. Hence fixed cost for the year 2004 is ₹ 52, 00,000 (1, 30,000×40). Therefore fixed cost for the year 2005 is ₹ 57, 20,000 (52, 00,000 + 10% of 52, 00,000).

Variable Cost for the year 2005 (₹ 40 + 25% of ₹ 40) = ₹ 50 per Unit

Hence Contribution per unit during 2005 is ₹ 50 (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 ₹ 39, 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 3

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

	May	June
	₹	₹
<i>(i) Budgeted Costs and Selling prices:</i>		
<i>Variable manufacturing cost per unit</i>	2.00	2.20
<i>Total fixed manufacturing cost (based on budgeted output of 25,000 units per month)</i>	40,000	44,000
<i>Total fixed marketing cost</i>	14,000	15,400

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<i>Selling price per unit</i>	5.00	5.50
(ii) <i>Actual production and sales:</i>		
	<i>Units</i>	<i>Units</i>
<i>Production</i>	24,000	24,000
<i>Sales</i>	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.*

You are required to calculate the relative effects on the monthly operating profits of applying: (i) Absorption costing and (ii) Marginal costing. (11 Marks) (May, 2006)

Answer

(a) Quantity tally:

		May 2003	June 2003
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	₹	40,000	44,000
Budgeted output	units	25,000	25,000
Fixed overheads absorption rate per unit	₹	1.60	1.76

(i) Profitability based on absorption costing:

	May 2003	June 2003
	₹	₹
<i>Sales:</i>		
May: 21,000 units @ ₹ 5.00	1,05,000	
June: 26,500 units @ ₹ 5.50		1,45,750
<i>Production Costs:</i>		
Variable: May 24,000 units @ ₹ 2.00	48,000	
June 24,000 units @ ₹ 2.20		52,800
Fixed: May 24,000 units @ ₹ 1.60	38,400	

June 24,000 units @ ₹ 1.76		42,240
Total production costs	86,400	95,040
<i>Add:</i> Opening stock		
May Nil		
June 3,000 units @ Res. 3.60*		10,800
Total	86,400	1,05,840
<i>Less:</i> Closing stock		
May 3,000 units @ ₹ 3.60*	10,800	
June 500 units @ ₹ 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		
Actual output		
Shortfall		
Under recovery of fixed overheads		
May 1,000 units @ ₹ 1.60	1,600	
June 1,000 units @ ₹ 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
	₹	₹
<i>Sales</i>	1,05,000	1,45,750
Production cost – variable	48,000	52,800
<i>Add:</i> Opening stock		
May Nil		

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June	3,000 units @ ₹ 2.00		<u>6,000</u>
Total		48,000	58,800
<i>Less: Closing stock</i>			
	May 3,000 units @ ₹ 2.00	6,000	
	June 500 units @ ₹ 2.20		1,100
Variable cost of goods sold		42,000	57,700
Contribution		63,000	88,050
<i>Fixed costs:</i>			
	May	June	
Production	40,000	44,000	
Marketing	14,000	15,400	54,000
Net profit		9,000	28,650

Question 4

Zilmil Ltd. makes two products 'Brightly' and 'Lightly'. Both the products use the same labour force, the size of which is restricted to 78,000 hours per month. Brightly needs 2 hours per unit to make whereas lightly needs one hour. The estimated production and sales, manufacturing and selling expenses per month are as follows:

	Brightly		Lightly	
Production and Sales (in Nos.)	12,000	16,000	40,000	48,000
Cost per month (₹)	34,00,000	38,00,000	62,00,000	66,80,000

The Company is considering pricing option in a highly competitive market. It has estimated sales demand at various selling prices:

<i>Brightly:</i>						
Selling Price per unit (₹)	276	272	268	264	260	254
Sales demand per month	12,000	14,000	16,000	18,000	20,000	22,000
<i>Lightly:</i>						
Selling Price per unit (₹)	163	162	161	160	156	152
Sales demand per month	40,000	42,000	44,000	46,000	48,000	50,000

You are required to compute profit maximizing price and quantity for each product.

(11 Marks) (May, 2006)

Answer

Brightly

Unit price ₹	Contribution per unit ₹	Volume Units	Total contribution (₹ in 000)	Incremental contribution (₹ 000)	Labour hours	Incremental labour hours	Incremental contribution per labour hour ₹	Rank
276	176	12000	2112	2112	24000	24000	88	2
272	172	14000	2408	296	28000	4000	74	6
268	168	16000	2688	280	32000	4000	70	7
264	164	18000	2952	264	36000	4000	66	8
260	160	20000	3200	248	40000	4000	62	9
254	154	22000	3388	188	44000	4000	47	10

Lightly

Unit price	Contribution per unit	Volume	Total contribution (₹ in 000)	Incremental contribution (₹ 000)	Labour hours	Incremental labour hours	Incremental contribution per labour hour	Rank
163	103	40,000	4120	4,120	40,000	40,000	103	1
162	102	42,000	4284	164	42,000	2,000	82	3
161	101	44,000	4444	160	44,000	2,000	80	4
160	100	46,000	4600	156	46,000	2,000	78	5
156	96	48,000	4608	8	48,000	2,000	4	11
152	92	50,000	4600	(8)	50,000	2,000	(4)	Loss

As the labour time is scarce source (time available 78,000 hours), the decision has to be taken on the basis of ranks based upon incremental contribution per labour hour.

Product	Price	Incremental volume	Incremental labour hours	Balance hours	Incremental Contribution (in 000 ₹)
Lightly	163	40,000	40,000	38,000	4120
Brightly	276	12,000	24,000	14,000	2112
Lightly	162	2,000	2,000	12,000	164
Lightly	161	2,000	2,000	10,000	160
Lightly	160	2,000	2,000	8,000	156
Brightly	272	2,000	4,000	4,000	296

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Brightly	268	2,000	4,000		<u>280</u>
Total					<u>7,288</u>

Hence product mix is Brightly – 16,000 units and Lightly 46,000 units

Optimal contribution per month	₹ 72,88,000
Fixed costs per month	₹ 60,00,000
Optimal profit per month	₹ 12,88,000

Working Notes:

	<i>Brightly</i>	<i>Lightly</i>
Variable cost (p.u.)	$\frac{(38,00,000 - 34,00,000)}{(16,000 - 12,000)} = ₹ 100$	$\frac{(66,80,000 - 62,00,000)}{(48,000 - 40,000)} = ₹ 60$
Fixed cost (₹)	22,00,000	38,00,000

Contribution = Unit selling price less variable cost per unit.

Question 5

"The use of Absorption costing method in decision-making process leads to anomalies."
 Discuss. (4 Marks) (May, 2006)

Answer

In absorption costing, fixed overheads are assigned to products by establishing overhead absorption rates based on budgeted or normal output. By using absorption costing principles, it is possible for profit to decline when sales volume increases. If the stock levels fluctuate significantly, profits may be distorted because stock changes will significantly affect the amount of fixed overheads allocated to a period. If profits are measured on monthly or quarterly or on periodical basis, seasonal variations in sales may cause significant fluctuations in profits.

Internal profit statements on monthly or quarterly basis are used for measuring the managerial performance. In the circumstances, managers may deliberately alter inventory levels to influence profit, if absorption costing is used. When sales are less and the closing inventory increases, a part of the fixed overheads contained in the value of the closing stock is reduced from the fixed costs allocated to production for the period. Thus, if sales are reduced, inventories will increase and absorption cost will post higher profits. Similarly, if sales are increased as compared to production, inventories will be reduced and absorption costing will return lower profits.

Question 6

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

	₹ per unit
Selling price	500
Direct material	150
Direct labour	100
Variable overhead	50
Fixed cost = ₹ 2 lakhs.	

The product is manufactured by a machine, whose spare part costing ₹ 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 ₹ 2,000.

- Prepare the profitability statement for production levels of 2,000 units and 3,000 units, when fixed cost = ₹ 1 lakhs.
- What is the break-even point (BEP) for the above data?
- Comment on the BEP, if the fixed cost can be reduced to ₹ 1,80,000 from the existing level of 2 lakhs. (6 Marks) (Nov. 2006)

Answer

(i) X Ltd. Profitability Statement:

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

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

$$\frac{3,000}{100} \times 2,000 = 60,000$$

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- (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 ₹ $20 \left(\frac{2,000}{100} \right)$.

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

₹ 500 – ₹ 150 – ₹ 100 – ₹ 50 = ₹ 200

- (iii) When fixed cost is ₹ 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
	₹	₹
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 7

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:

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

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. (11 Marks, May, 2007)

Answer

(i & ii)

Profitability under absorption costing system		Actual profit and loss account	
Particulars	₹ 000's	Particulars	₹ 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)

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Working Notes:

	₹		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)	<u>50</u>	Closing stock	200
Total	<u>300</u>		

(iii) Reconciliation

	₹ 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 ₹ 5,000 shall need to be identified as part of reconciliation.

Question 8

A research project, to date, has cost a company ₹ 2,50,000 and is under review. It is anticipated that, should the project be allowed to proceed, it will be completed in about one year and can be sold for ₹ 4,00,000. The following additional information is available:

- (i) Materials have just been received for ₹ 60,000. These are extremely toxic, and if not used in the project, have to be disposed of by special means at ₹ 15,000.
- (ii) Labour: ₹ 75,000. The men are highly skilled. If they are released from the Research Project, they may be transferred to the Works Department of the company and consequently the sales could increase by ₹ 1,50,000. The accountant estimates that the prime cost of those sales would be ₹ 1,00,000 and the overhead absorbed (all fixed) would amount to ₹ 25,000.
- (iii) Research staff: ₹ 1,60,000. A decision has already been taken that this will be the last major piece of research undertaken and consequently, when work on the project ceases, the staff involved will be made redundant. Redundancy and severance pay have been estimated at ₹ 25,000.
- (iv) Share of General Building Expenses : ₹ 35,000.

The Managing Director is not sure what is included in this amount, but the accounts staff charge similar amounts each year to each department.

You are required to advise whether the project should be allowed to proceed and explain the reasons for the treatment of each of the amounts above in your analysis.

(May 2007, 10 marks)

Answer

Research Project

Particulars	Relevancy	Reason	Amount
			(₹ '000s)
Project cost till date	Not relevant	Sunk cost	–
Sale price of the project	Relevant	Incremental revenue/opportunity gain	400
Cost of materials received	Not relevant	Sunk cost	–
Cost of disposal of materials	Relevant	Avoidable/opportunity cost	15
Cost of labour	Not relevant	Common costs	–
Contribution lost on the alternative use	Relevant	Opportunity cost [Sales – (Prime cost – labour)]	(125)
Absorbed Fixed overheads	Not relevant	Sunk cost	–
Cost of Research Staff	Relevant	Incremental / out of pocket	(160)
Redundancy and severance pay	Not relevant	Common costs	–
Share of General Building expenses	Not relevant	Sunk costs	–
Total incremental inflow if the project is proceeded with			<u>130</u>

Decision: Better to continue the project.

Question 9

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

	₹
<i>Sales</i>	<i>40,000</i>
<i>Raw materials</i>	<i>20,000</i>
<i>Direct wages</i>	<i>6,000</i>

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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 ₹ 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?
(May 2007, 4 Marks)

Answer

Particulars (Data per unit)	2006	2007
	₹	₹
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

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 ₹ 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:

			₹
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 ₹ 6 per unit towards overtime labour. The premium so paid has been included in the direct labour cost of ₹ 36,000 given above.

You are required to compute the Break-even point.

(6 Marks, May 2007)

Answer

Data / Unit	1 – 500	501 – 1,500
	₹	₹
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
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 ₹ 20. After 500 units it is ₹ 26.

Question 11

A manufacturer produces three products whose cost data are as follows:

	X	Y	Z
Direct materials (₹ / Unit)	32.00	76.00	58.50

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Direct Labour:

Deptt.	Rate / hour (₹)	Hours	Hours	Hours
1	2.50	18	10	20
2	3.00	5	4	7
3	2.00	10	5	20
Variable overheads (₹)		8	4.50	10.50

Fixed overheads (₹) 4,00,000 per annum.

The budget was prepared at a time, when market was sluggish. The budgeted quantities and selling prices are as under:

Product	Budgeted quantity (Units)	Selling Price / unit (₹)
X	19,500	135
Y	15,600	140
Z	15,600	200

Later, the market improved and the sales quantities could be increased by 20 per cent for product X and 25 per cent each for product Y and Z. The sales manager confirmed that the increased sales could be achieved at the prices originally budgeted. The production manager stated that the output could not be increased beyond the budgeted level due to the limitation of Direct labour hours in department 2.

Required:

- Prepare a statement of budgeted profitability.*
- Set optimal product mix and calculate the optimal profit. (14 Marks, Nov 2007)*

Answer

Working Notes:

(Amount in Rupees)

	X	Y	Z
Selling price per unit (A)	135.00	140.00	200.00
Variable costs per unit			
Direct material	32.00	76.00	58.50
Direct labour			
Department 1	45.00	25.00	50.00
Department 2	15.00	12.00	21.00
Department 3	20.00	10.00	40.00

Variable overheads	<u>8.00</u>	<u>4.50</u>	<u>10.50</u>
Total variable costs (B)	<u>120.00</u>	<u>127.50</u>	<u>180.00</u>
Contribution per unit (A–B)	<u>15.00</u>	<u>12.50</u>	<u>20.00</u>

(i) **Statement of budgeted profitability**

	X	Y	Z	
Budgeted quantity (units)	19,500	15,600	15,600	
Contribution per unit (₹)	15.00	12.50	20.00	
Total contribution (₹)	2,92,500	1,95,000	3,12,000	
Contribution fund (₹)				7,99,500
Fixed overheads (₹)				<u>4,00,000</u>
Profit (₹)				<u>3,99,500</u>

(ii) **Contribution per direct labour hour for Department 2**

	X	Y	Z
Contribution per unit (₹)	15.00	12.50	20
Direct labour hours per unit	5	4	7
Contribution per labour hour	3.00	3.125	2.857
Rank	II	I	III

(iii) **Total hours available in department 2**

X	19,500 units × 5 =	97,500 hours
Y	15,600 units × 4 =	62,400 hours
Z	15,600 units × 7 =	<u>1,09,200 hours</u>
Total		= <u>2,69,100 hours</u>

Optimal Product Mix

Product	Maximum Sales (units)	Direct labour hours available	Hours per unit	Output (units)	Hours used	Balance hours
Y	19,500	2,69,100	4	19,500	78,000	1,91,100
X	23,400	1,91,100	5	23,400	1,17,000	74,100
Z	19,500	74,100	7	10,585	74,095	5

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Optimal profit (₹)		
Contribution (₹)		
Y	19,500 × ₹ 12.50	= ₹ 2,43,750
X	23,400 × ₹ 15	= ₹ 3,51,000
Z	10,585 × ₹ 20	= <u>₹ 2,11,700</u>
Total Contribution		= ₹ 8,06,450
Less fixed cost		= <u>₹ 4,00,000</u>
Profit		= <u>₹ 4,06,450</u>

Question 12

A company manufactures a single product, which requires two components. The company purchases one of the components from two suppliers: X Limited and Y Limited. The price quoted by X Limited is ₹ 180 per hundred units of the component and it is found that on an average 3 per cent of the total receipt from this supplier is defective. The corresponding quotation from Y Limited is ₹ 174 per hundred units, but the defective would go up to 5 per cent. If the defectives are not detected, they are utilised in production causing a damage of ₹ 180 per 100 units of the component.

The company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated at ₹ 24 per 100 units of the component. Such an inspection will be able to detect only 90 per cent of the defective components received. No payment will be made for components found to be defective in inspection.

Required:

(i) Advise whether inspection at the point of receipt is justified?

(ii) Which of the two suppliers should be asked to supply?

(Assume total requirement is 10,000 units of the component). (Nov 2007, 10 Marks)

Answer

Calculation of cost of per 100 units of good components:

(A)	X Ltd.	Y Ltd.
If not inspected		
Units required	10,000	10,000
Estimated defectives	300	500
	(3%)	(5%)

Cost	₹	₹
Purchase price (₹)	18,000	17,400
Production damage (₹)	<u>540</u>	<u>900</u>
Total Cost (₹)	<u>18,540</u>	<u>18,300</u>
Good component (units)	9,700	9,500
Cost per 100 good component (₹)	<u>191.13</u>	<u>192.63</u>
(B) If inspected		
Defectives not detected	30	50
Defectives detected	270	450
Components paid for	9,730	9,550
Cost	₹	₹
Purchase cost	17,514	16,617
Inspection cost	2,400	2,400
Production damage	<u>54</u>	<u>90</u>
Total cost	<u>19,968</u>	<u>19,107</u>
Good components	<u>9,700</u>	<u>9,500</u>
Cost per 100 good components (₹)	<u>205.86</u>	<u>201.3</u>

Decision:

- (i) On the basis of the cost per 100 good component calculated at (A) and (B) above, it is concluded that inspection at the point of receipt is not justified.
- (ii) It will be advantageous to purchase the component from X Ltd.

Question 13

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

Figs. – ₹ '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%.

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- (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 ₹ 8,00,000.
- (b) Total overhead cost inflation for 2007 has been 5% more than 2006.
- (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:

- (i) Prepare a statement showing the estimated trading results for 2008.
- (ii) Calculate the Break-even point for 2007 and 2008.
- (iii) Comment on the BEP and profits of the years 2007 and 2008. (May 2008, 12 Marks)

Answer

(a) (i) Trading Results

Figures ₹ '000

	2006	2007	2008	Workings
Sales:		3,000	4,050 (Refer to Note 1)	$(3,000 \times 1.5 \times .9)$
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> (Refer Note 2)	<u>477</u>	$(300 \times 1.06 \times 1.5)$
Total Variable Cost		<u>1,800</u>	<u>2,835</u>	Total variable cost
Contribution		1,200	1,215	
Fixed Overhead		600 (Refer to Note 3)	450	$(600 \times .75)$
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%

$$\text{BEP} \quad \text{Fixed Cost/PV Ratio} \quad \frac{600}{40\%} = 1,500 \quad \frac{450}{30\%} = 1,500$$

(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 = $900 - 840 = ₹ 60$

₹ 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

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

(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 ₹ 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

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than made up by decrease in fixed cost so that overall profit has increased by 27.5%.

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

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

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

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

$$V_0 q_0 + F_0 = 800$$

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

$$V_1 q_0 - V_0 q_0 = 40$$

$$V_0 q_0 = V_1 q_0 - 40$$

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

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

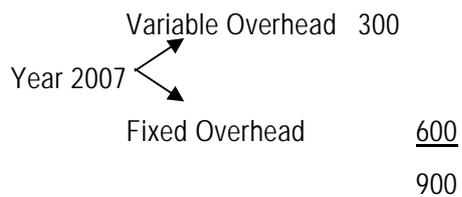
$$V_1 q_1 + F_1 = \underline{900}$$

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

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

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

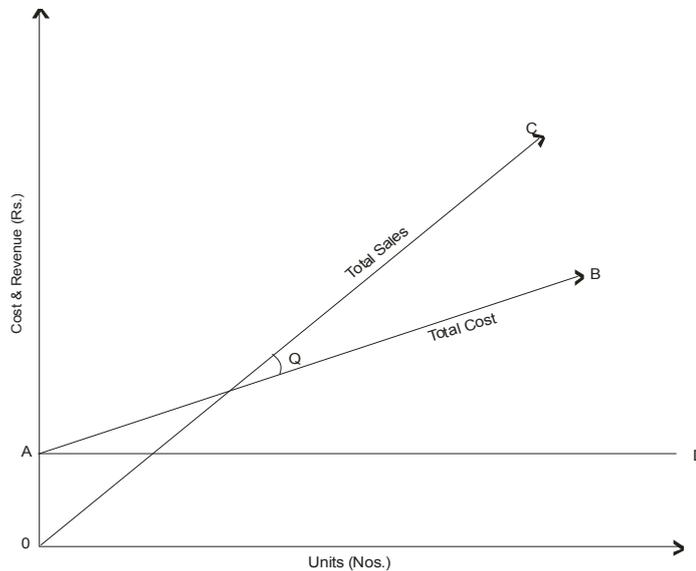
$$V_1 q_1 = \frac{-75}{-.25} = 300$$



Question 14

Draw and explain the angle of incidence in a break-even chart. What is its significance to the management? (May 2008, 3 Marks)

Answer



Angle of incidence (θ) 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 15

Is it justifiable to sell at a price below marginal cost at any time? Mention the circumstances in which it is justifiable. (May 2008, 6 Marks)

Answer

It is justifiable to sell at a price below marginal cost for a limited period.

The circumstances may be:

- (i) Where materials are of perishable nature.
- (ii) Where stocks have been accumulated in large quantities and the market prices have fallen. This will save the carrying cost of stocks, e.g., electronic goods – market prices fall due to quick obsolescence or advanced technological replenishment.
- (iii) It is essential to reduce the prices to such an extent in order to popularize a new product.
- (iv) Where such reduction enables the firm to boost the sales of other products having larger profit margin.

Question 16

What are the major areas of decision-making in which differential costing is used?

(May 2008, 4 Marks)

Answer

Differential costing can be used for all short, medium and long term decisions. When two levels of activities are being considered, or while choosing between competing alternatives differential cost analysis is essential. The differential cost is useful for decision making in the following areas:

- ◆ Capital expenditure decisions
- ◆ Make or buy decision
- ◆ Production planning
- ◆ Sales mix decision
- ◆ Production or product decision
- ◆ Change in level or nature of an activity.

Question 17

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

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

(ii) As per past record the spending pattern of each tourist staying in the lodge will be as under:

₹ 50 per day in the shopping arcade and ₹ 80 per day in the restaurant.

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

<i>Shops</i>	<i>Restaurant</i>
<i>50%</i>	<i>60%</i>

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

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

Required:

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

- (ii) *The Lodging House Manager suggests a proposal of reducing room rent to ₹ 150 per day on double occupancy basis, which will increase occupancy level to 95%. Should the proposal be accepted or not? (May 2008, 7 Marks)*

Answer

- (i) Income Statement of Kangan Resort for the next year

	₹
Sales Revenue	
Lodging house room receipts (40 Rooms × 200 days × ₹ 200 × 85%)	13,60,000
Shopping Arcade (40 Rooms × 2 persons × 200 days × ₹ 50 × 85%)	6,80,000
Restaurant (40 Rooms × 2 persons × 200 days) × ₹ 80 × 85%)	<u>10,88,000</u>
Total Sales Revenue	<u>31,28,000</u>
Variable Cost	
Lodging house rooms (40 Rooms × 200 days × ₹ 30 × 85%)	2,04,000
Shopping Arcade (50% of ₹ 6,80,000)	3,40,000
Restaurant (60% of ₹ 10,88,000)	<u>6,52,800</u>
Total Variable Cost	<u>11,96,800</u>
Contribution (Total Sales Revenue – Total Variable Cost)	19,31,200
Less: Fixed Cost	<u>10,00,000</u>
Profit (Estimated)	<u>9,31,200</u>

- (ii) Income Statement on the basis of reduced room rent

	₹
Sales Revenue	
Lodging house room receipts (40 Rooms × 200 days × ₹ 150 × 95%)	11,40,000
Shopping Arcade (40 Rooms × 2 persons × 200 days × ₹ 50 × 95%)	7,60,000
Restaurant (40 Rooms × 2 persons × 200 days × ₹ 80 × 95%)	<u>12,16,000</u>
Total Revenue	<u>31,16,000</u>
Less: Variable Cost	
Lodging house rooms (40 Rooms × 200 days × ₹ 300 × 95%)	2,28,000
Shopping Arcade (50% of ₹ 7,60,000)	3,80,000
Restaurant (60% of ₹ 12,16,000)	<u>7,29,600</u>
Total Variable Cost	<u>13,37,600</u>
Contribution	17,78,400
Less: Fixed Cost	<u>10,00,000</u>
Profit	<u>7,78,400</u>

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The profitability decreases by $9,31,200 - 7,78,400 = ₹ 1,52,800$.

Hence reducing room rent proposal may not be accepted.

Alternative Solution :

Occupancy ratio 85%

Lodging facilities for 200 days

40 twin bedded rooms – ₹ 200 per night

Shopping Arcade = ₹ 50 per day.

Restaurant = ₹ 80 per day.

Annual Fixed Overhead ₹ 10,00,000.

	Lodging House	Shopping Arcade	Restaurant	
	30/days/ occupied/room	Variable Cost 50%	60%	
Revenue 40 rooms × 200 days × 85% × 200 ₹ / person × 2 persons / room				
Days:	170	170	170	
No. of persons: 2 × 170 × 40:	13,600			
Revenue / person	100	50	80	
Revenue	1,360	680	1,088	in '000
Variable Cost 30 × 170 × 40	<u>204</u>	<u>340</u>	<u>652.80</u>	
Contribution	1,156	340	435.20	

Contribution 19,31,200

Fixed Cost 10,00,000

Profit 9,31,200

Room Days: $95\% \times 40 \times 200 = 7,600$

Person days 15,200

Rev. $150/2 \times 15,200$ 1,140 760 1,216

Cost: 30/days : 228 380 729.6

912 380 486.4

1,778.40

No, do not accept the proposal as there is decrease in profit by ₹ 1,52,800.

Question 18

State the characteristic features of a database created for operational control and decision making. (Nov 2008, 4 Marks)

Answer

The characteristic features of a data-base created for operational control and decision making are as under:

- (i) There should be a file structure that facilitates the association of one internal record with other internal records.
- (ii) There should be cross functional integration of files.
- (iii) Independence of program / data file for ease of updating and maintenance of data base.
- (iv) There must be common standards throughout with respect to data definitions, record formats and other data descriptions.
- (v) A data dictionary should be available.

Question 19

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:

<i>Factory costs</i>	<i>₹ 33 per unit</i>
<i>Selling and Administration costs</i>	<i>₹ 9 per unit</i>

Fixed costs:

<i>Factory costs</i>	<i>₹ 21,60,000</i>
<i>Selling and Administration costs</i>	<i>₹ 7,56,000</i>

Selling Price

<i>Selling price per unit</i>	<i>₹ 60</i>
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The actual production, sales, price and cost data relating to the year under review are as given below:

<i>Production</i>	<i>2,40,000 units</i>
<i>Sales</i>	<i>2,25,000 units</i>
<i>Finished goods stock in the beginning of the year:</i>	<i>15,000 units</i>
<i>Actual factory variable costs exceeded the budget by</i>	<i>₹ 1,20,000</i>

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Required:

- (i) Calculate the budgeted profit and break-even point in units.
- (ii) What increase in selling price was necessary during the year under review to maintain the budgeted profit?
- (iii) Prepare statements showing the actual profit during the year under review by using (1) absorption costing method and (2) marginal costing method. (11 Marks, Nov 2008)

Answer

(i) Contribution per unit:

	₹	₹
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	₹	₹
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	₹	₹
	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 (₹)	48,60,000
B. Actual production (units)	2,40,000
C. Contribution desired per unit (A ÷ B) (₹)	20.25
D. Variable cost per unit (₹)	42.50
E. Selling price required to maintain budgeted profit (C + D) (₹)	62.75
F. Increase in selling price necessary ₹ (62.75 – 60)	2.75

(iii) Fixed overhead recovery rate:

Fixed factory overheads	₹ 21,60,000
Normal Production	2,70,000 units

Absorption Rate per unit : $21,60,000 / 2,70,000 = ₹ 8$

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

1. Profitability based on Absorption Costing Method:

	₹	₹
A. Sales (2,25,000 units @ ₹ 60)		<u>1,35,00,000</u>
B. Production costs:		

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Variable factory cost:(2,40,000 units × ₹ 33)	79,20,000	
Increase in cost	1,20,000	
Fixed factory costs (2,40,000 units × ₹ 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 × ₹ 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 × ₹ 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) × ₹ 8		<u>2,40,000</u>
Profit		<u>11,49,000</u>

$$\begin{aligned}
 \text{Cost of opening stock (per unit)} &= \text{Variable Factory cost} + \text{Fixed overhead recovery rate} \\
 &= ₹ 33 \text{ per unit} + ₹ 8 \text{ per unit} \\
 &= ₹ 41 \text{ per unit.}
 \end{aligned}$$

Profitability based on Marginal Costing Method:

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

	<i>Add:</i> Opening Stock (15,000 units × ₹ 33)	<u>4,95,000</u>	
B	Production variable cost of goods sold	75,30,000	
C	Variable Selling & Administrative Expenses (2,25,000 × ₹ 9)	20,25,000	
D	Total variable costs (B + C)		<u>95,55,000</u>
E	Contribution (A – D)		39,45,000
F	<i>Less:</i> 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 20

Explain the concept of relevancy of cost by citing three examples each of relevant costs and non-relevant costs.
(Nov 2008, 4 Marks); (May 2004, 4 Marks)

Answer

Relevant costs are those costs which are pertinent to a decision. In other words, these are the costs which are influenced by a decision. Those costs which are not affected by the decision are not relevant costs.

Examples of relevant costs are:

- (1) All variable costs are relevant costs.
- (2) Fixed Costs which vary with the decision are relevant costs.
- (3) Incremental costs are relevant costs.

Examples of non-relevant costs:

- (1) All fixed costs are generally non-relevant.
- (2) Variable costs which do not vary with the decision are not relevant costs.
- (3) Book value of the asset is not relevant.

Question 21

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

	<i>(Figures in Rupees per unit)</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
<i>Selling price (peak-season)</i>	<i>550</i>	<i>630</i>	<i>690</i>
<i>Selling price (off-season)</i>	<i>550</i>	<i>604</i>	<i>690</i>
<i>Material cost</i>	<i>230</i>	<i>260</i>	<i>290</i>

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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 ₹ 26,780 for each season, of which ₹ 2,000 is towards salary for special technician, incurred only for product B, and ₹ 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:

- Advise the company about the best product mix during peak-season for maximum profit.
- What will be the maximum profit for the off-season? (12 Marks) (Nov., 2008)

Answer

Bloom Ltd.
Peak Season.
Statement of Contribution and BEP (in units)

Figures ₹

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
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)	$\frac{20,000}{100} = 200$	$\frac{22,000}{110} = 200$	$\frac{24,780}{105} = 236$	

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

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

Bloom Ltd.

Off Season

Statement of Contribution and demand

Figures ₹ per unit

Product	A	B	C	
A Selling Price	550	604	690	

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	Direct Material	230	260	290	
	Direct Labour	100	99	149	
	Production-Variable Overhead	<u>100</u>	<u>120</u>	<u>130</u>	
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 (₹)	-	14,375	12,100	26,475	26,780	(305)
Option 2: Units	100	115	-	215		
Contribution (₹)	12,000	14,375	-	26,375	22,000	4,375
Option 3: Units	80	-	135	215		
Contribution (₹)	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 = ₹ 4,375.

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

Question 22

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

	₹ lakhs
Sales	<u>20.00</u>
Direct materials	3.60
Direct labour	6.40

<i>Factory overheads:</i>	
<i>Variable</i>	2.20
<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 ₹ 36,000 and ₹ 64,000. This special order is in excess of the budgeted sales as envisaged above. The company submitted a quotation of ₹ 2,00,000 for the special order based on its policy. The new customer is willing to pay a price of ₹ 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. (7 Marks)(Nov., 2008)

Answer

Analysis of Cost and profit:

	₹ (lakhs)	₹ (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>

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Total cost		18.00
Profit		<u>2.00</u>
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:

	₹
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:

- Factory overheads only are to be recovered on the basis of direct wages.
- The special order is a direct order. Hence commission is not payable.
- 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 ₹ 2.20 lakhs

Direct wages ₹ 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:

	₹
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 ₹ 1,50,000.

Question 23

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

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

Each unit is sold for ₹ 21, with an additional variable selling overhead incurred at ₹ 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 ₹ 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 ₹ 14,000.

You are required:

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

(6 Marks) (Nov., 2008)

Answer

Contribution per tin = Selling Price – Variable cost

$$= 21 - (7.8 + 2.1 + 2.5 + 0.6) = ₹ 8 \text{ per tin.}$$

Loss on operation:

Fixed cost per annum = 2,00,000 units × 4 per unit = 8 lakhs.

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

	₹
Fixed cost for the quarter	2,00,000
Less: Contribution on operation (8 × 10,000)	<u>80,000</u>
Expected loss on operation	<u>(1,20,000)</u>

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Loss on shut down:

	₹
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 ₹ 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 24

Vikram Ltd. produces 4 products using 3 different machines. Machine capacity is limited to 3,000 hours for each machine. The following information is available for February, 2009

Products	A	B	C	D
Contribution (Sales-direct material) ₹	1,500	1,200	1,000	600
Machine Hours Required/Unit :				
Machine 1	10	6	2	1
Machine 2	10	9	3	1.5
Machine 3	10	3	1	0.5
Estimated Demand (units)	200	200	200	200

From the above information you are required to identify the bottleneck activity and allocate the machine time. (7 Marks)(June, 2009)

Answer

Machine	Time required for products				Total Time	Time Available	Machine utilization
	A	B	C	D			
1	2000	1200	400	200	3800	3000	126.67%
2	2000	1800	600	300	4700	3000	156.67%
3	2000	600	200	100	2900	3000	96.67%

Since Machine 2 has the highest machine Utilization it represents the bottleneck activity hence

product, ranking & resource allocation should be based on contribution/machine hour of Machine 2.

Allocation of Resources						
	A	B	C	D	Machine Utilization	Spare Capacity
Contribution per unit (₹)	1500	1200	1000	600		
Time required in Machine 2	10	9	3	1.5		
Contribution per Machine – hour (₹)	150	133.33	333.33	400		
Rank as per contribution / mach. Hour	3 rd	4 th	2 nd	1 st		
Allocation of Machine 2 time	200×10 = 2000	100 (balancing figure)	200×3 = 600	200×1.5 = 300	3000	
Production Quantity	200	100/9=11.11	200	200		
Allocation Machine 1 time	2000	11.11×6 = 66.66	400	200	2666.66	333.34
Allocation of Machine 3 time	2000	11.11×3 = 33.33	200	100	2333.33	666.67

Question 25

Explain briefly the concepts of Opportunity costs and Relevant costs. (4 Marks)(June, 2009)

Answer

Opportunity cost is a measure of the benefit of opportunity forgone when various alternatives are considered.

Or

It is the cost of sacrifice made by alternative action chosen.

E.g. opportunity cost of funds invested in business is the interest that could have been earned by investing the funds in bank deposit.

Relevant Cost:

Expected future costs which differ for alternative course.

(Or)

It is not essential that all variable costs are relevant and all fixed costs are irrelevant. Fixed, or variable costs that differ for various alternatives are relevant costs. Relevant costs draw our attention to those elements of cost which are relevant for the decision.

E.g. Direct labour under alternative I – ₹ 10/ hour

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Direct labour under alternative II – ₹ 20/hour

Then, direct labour is relevant cost.

Question 26

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.

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 ₹ 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 ₹ 30 per unit. B can buy product A from outside at ₹ 200 per unit, but has to incur ₹ 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:

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

The outside demand can be freely had upto 900units.

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?*

(12 Marks)(June, 2009)

Answer

- (i) Contribution per unit against sale to outside = ₹ (200-120-20) = ₹ 60
 In case of transfer, good units and rejected units are in proportion of 9:1
 In case of transfer, contribution per good unit = ₹ (190 – 120) = ₹ 70
 In case of transfer, contribution per rejected unit = ₹ (150 – 120-100) = ₹ -70
 Thus, effective contribution per unit of transfer = ₹ (70 x 0.9 – 70x 0.1) = ₹ 56
 As contribution per unit against outside sale is higher, the best strategy should be to sell maximum number of unit to outside market.
 Contribution from outside market from sale of 900 units = ₹ 54,000
 ₹ (900 x 60)
 Contribution from transfer of 300 units to B = ₹ 16,800
 ₹ (300 x 56)
 Total Contribution from best strategy = ₹ 70,800
- (ii) If B's demand is 540 unit, total production required = 600 units.
 (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 = ₹ 36,000
 ₹ (600 x 60)
 Contribution from rejected 60 units = ₹ (4,200)
 ₹ (60 x – 70) _____
= ₹ 31,800
- To keep same level of contribution as in (i), the contribution required from transfer of 540 unit to B = ₹ 39,000
 (₹ 70,800 – 31,800)
 Thus, contribution required per unit = ₹ 72.22
 ₹ 39,000 /540
 Hence price to be charged per unit against transfer to B = ₹ 192.2
 ₹ (20 + 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.

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

	Department A	
	Outside ₹	to B ₹
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 : ₹ 60 (900) + ₹ 56 (300)
= ₹ 54,000 + ₹ 16,800

Contribution = ₹ 70,800

Fixed Cost = ₹ 36,000

(i) Profit = ₹ 34,800

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

Present suitable calculations in favour of your argument. (8 Marks)(June, 2009)

Answer

Units	Average/ hrs/u.
1	2,000
2	1,600
4	1,280
8	1,024
Material Cost / u	= 10,000
Variable cost	= <u>2,000</u>
Variable Cost	= <u>12,000</u>

Option I

If both the orders came together, learning rate 80% applies and 8 units can be made, with average time of 1,024 hours per unit.

Cost to PQ:

Variable cost excl. labour	= ₹ 12,000
Labour cost 1,024 hrs × 4 ₹ /hr	= ₹ <u>4,096</u>
	= ₹ <u>16,096</u>

In this case,

	Y	X	
Selling Price p. u.	₹ 17,200	₹ 16,500	→ (under option I)
Variable Cost p. u.	<u>₹ 16,096</u>	<u>₹ 16,096</u>	
Contribution p. u.	₹ 1,104	₹ 404	
No. of units	4	4	
Contribution (₹)	4416	1616	6032

Option II

If X Ltd supplies its labour. 80% learning curve will apply to 4 units each of PQ & X.

Hence: hrs/ u = 1280

	Y	X	
Selling Price	₹ 17,200	₹ 14,000	
Variable Cost (excl. labour)	₹ 12,000	₹ 12,000	

Labour cost:			
1280 × 4	₹ 5,120		
1280 × 1	<u> </u>	₹ 1280	
Total Variable Cost	₹ 17,120	₹ 13,280	
Contribution	₹ 80	₹ 720	
Units	4	4	
Contribution (₹)	320	2,880	3,200

PQ should not take labour from X Ltd. It should choose option I.

Question 28

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 ₹ 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:

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

₹ 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 ₹ 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 ₹ 5,000 per unit on shipping costs. In this market also, the selling price that each unit will fetch is ₹ 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.*

(13 Marks)(June, 2009)

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Answer

(a)

	Order Qty 100-140 (₹)	Order Qty 141-200 (₹)
Selling Price ₹ /u	30,000	30,000
Commission @ 10%	3,000	3,000
Sales revenue p. u.	33,000	33,000
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, Ret Ltd. will earn a contribution of ₹ 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 ₹ 2,25,000

Units		100	141	150	190
No. of Camera Boxes	A	2	3	3	4
Cost of Cameras (₹)	B	4,50,000	6,75,000	6,75,000	9,00,000
Contribution (₹ /u) ₹ 4,000	C	400,000			
Contribution (₹) first 110 units @ 7,000/u	D		7,70,000	7,70,000	7,70,000
Contribution (₹) Balance units @ 2,000/u	E		62,000	80,000	1,60,000
Total Contribution (F = C + D + E) (₹)	F	4,00,000	8,32,000	8,50,000	9,30,000
Profit (F) – (B) (₹)	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 ₹ /u = $\frac{50,000}{2,000} = 25$

∴ BEP = 150 + 25 = 175 units

Alternative Solution

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

	Units sold			
	110	140	150	190
Margin per unit = Sales price – buying price + commission (₹)	4000	4000	7000	7000
Margin (Excluding shipping cost)	4,40,000	5,60,000	10,50,000	13,30,000
Shipping cost (₹)		30 x 5000	40 x 5000	80 x 5000
For sale beyond 110 units		= 1,50,00	= 2,00,000	= 4,00,000
Contribution (₹)	4,40,000	4,10,000	8,50,000	9,30,000
Fixed cost (Cost of Cameras)	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 Cameras = ₹ 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 29

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:

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	A	B	C	D
Material cost (₹ /u)	64	72	45	56
Machining Cost (₹ /u @ ₹ 8 per hour)	48	32	64	24
Other variable costs (₹ /u)	32	36	44	20
Selling Price (₹ /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 (₹)
Upto 1,50,000	10,00,000
1,50,000 – 3,00,000	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 (₹ /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. (18 Marks)(Nov., 2009)

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 (₹ /u)	18	16	20	18
M/s Hours per unit	6	4	8	3
Contribution (₹ / M/c hr.)	<u>3</u>	<u>4</u>	<u>2.5</u>	<u>6</u>

Ranking	III	II	IV	I
Sub-Contract Cost ₹ /u)	146	126	155	108
Contribution (₹ /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 (₹)
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	4,77,000
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 ₹ 2/- per unit. 1,50,000 hrs can produce 25,000 units of A.

$$\therefore \text{Contribution increases by } 25,000 \times 2 = 50,000$$

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

But increase in fixed Cost = 50,000

At the 2nd level of operation, the increase in contribution by own manufacturing is exactly set up by increase in fixed costs by ₹ 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 them but towards own manufacture.

2.52 Advanced Management Accounting

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 = ₹ 34,000

C: 6,000 × 2 = ₹ 12,000
 = ₹ 46,000

Increase in fixed costs = ₹ 50,000

Additional Loss = ₹ 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 = ₹ 37,500

Increase in Cost = (₹ 50,000)

Level 3rd loss c/fd = (₹ 4,000)

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

Advice: Do not expand capacities; sell maximum

No. of units by operating at 1,50,000 hrs. capacity (level 1st) and gain ₹ 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
					33,24,000
Fixed Cost					10,00,000
Profit					23,24,000

Question 30

E Ltd. is engaged in the manufacturing of three products in its factory. The following budget estimates are prepared for 2009-10 :

	Products		
	A	B	C
<i>Sales (Units)</i>	10,000	25,000	20,000
<i>Selling price per unit. (₹)</i>	40	75	85
<i>Direct Materials per unit. (₹)</i>	10	14	18
<i>Direct wages per unit @ ₹ 2 p.hr.</i>	8	12	10
<i>Variable overhead per unit (₹)</i>	8	9	10
<i>Fixed overhead per unit (₹)</i>	16	18	20
<i>Profit/Loss</i>	-2	22	27

After the finalisation of the above manufacturing schedule, it is observed that presently only 80% capacity being utilised by these three products. The production activities are made at the same platform and it may be interchangeable among products according to requirement. In order to improve the profitability of the company the following three proposals are put for consideration:

- (a) *Discontinue product A and capacity released may be used for either product B or C or equally shared. The fixed cost of product A is avoidable. Expected changes in material cost and selling price subject to the utilisation of product A's capacity are as under:*

Product B : Material cost increased by 10% and selling price reduced by 2%

Product C : Material cost increased by 5% and selling price reduced by 5%.

- (b) *Discontinue product A and divert the capacity so released and the idle capacity to produce a new product D for meeting export demand whose per unit cost data are as follows:*

	₹
<i>Selling Price</i>	60
<i>Direct material</i>	28
<i>Direct wages @ ₹ 3 p. hr.</i>	12
<i>Variable overheads</i>	6
<i>Fixed cost (Total)</i>	1,05,500

2.54 Advanced Management Accounting

- (c) Product A, B and C are continuously run and hire out the idle capacity fixing a price in such a way that the same rate of profit per direct labour hour is obtained in the original budget estimates.

Required:

- (i) Prepare a statement of profitability of products A, B and C in existing situation.
(ii) Evaluate the above proposals independently and calculate the overall profitability of the company under each proposal.
(iii) What proposal should be accepted, if the company wants to maximise its Profit?

(10 Marks)(May, 2010)

Answer

- (i) Budgeted profitability statement under existing situation

	A (₹)	B(₹)	C (₹)	Total
Selling price	40	75	85	
Total Variable costs (Direct Material + Direct Labour +Variable overhead)	<u>26</u>	<u>35</u>	<u>38</u>	
Contribution	<u>14</u>	<u>40</u>	<u>47</u>	
Sales units	10000	25000	20000	
Contribution in (₹)	140000	1000000	940000	2080000
Fixed cost (₹)	<u>160000</u>	<u>450000</u>	<u>400000</u>	<u>1010000</u>
Profit/loss (₹)	<u>-20000</u>	<u>550000</u>	<u>540000</u>	<u>1070000</u>

- (ii) Proposal (a) Alternative use of A's Capacity for Product B or C or B & C Equally

Hours released for discontinuance of A = 10,000 x 4 = 40,000 hours

	Product B	Product C	B & C
No of Units Possible	40000/ 6 = 6666	40000/ 5 = 8000	B=3333 C= 4000

Revised Contribution of Product B and Product C

Particulars	B (₹)	C (₹)
Selling price	73.50	80.75
Variable cost: Direct Material	15.40	18.90
Direct wages	12.00	10.00
Variable overheads	9.00	10.00
Total Variable cost	36.40	38.90

Contribution	37.10	41.85
Number of Hours	6	5
Contribution per hour	6.18	8.37

Decision : It is better to produce C

Taking both changes in the selling price and material cost are for the entire production or the incremental production. Profitability is calculated below:

Proposal (a) : Profitability statement if A's capacity utilized by C

Particulars	Option 1 Changes for entire production (₹)	Option 2 Changes for incremental production (₹)
Sales Volume	28000	8000
Contribution per unit	41.85	41.85
Total Contribution	1,17,1800	3,34,800
Less Fixed Cost	400000	0
Profit	771800	334800
Existing Profit of B	550000	550000
Existing Profit of C		540000
Total Profit	1321800	1424800

Proposal (b)

Existing capacity = (4 x 10,000 + 6 x 25,000 + 5x 20,000) = 290000 hrs

Then, Idle capacity of 20% = .290000 /4 = 72500 hours

Capacity for product 'D' = (idle + A's spare) capacity = 72500 + 40000 = 112500 hours,

No. of units 'D' produced = 112500/4 = 28125 units.

Profitability Statement – proposal (b)

Units	D (₹)
Selling price	60
Less : Variable cost :	28
Direct wages	12
Variable Overheads	6
Contribution	14
Contribution amount (₹)	393750
Less fixed cost	105500

2.56 Advanced Management Accounting

Profit	288250
Add : Existing Profit B & C	1090000
Total Profit	1378250

Proposal (c) Hiring Out idle capacity

Particulars	(₹)
Idle Hours	72,500
Existing Profit per hour (1070000/290000)	3.69
Revenue from Hire out	267500
Existing Profit	1070000
Total Profit	1337500

Profit Summary of alternatives (₹ in 000's)

Existing	Proposal(a) Option 1	Proposal (a) Option 2	Proposal (b)	Proposal (c)
1070.00	1321.80	1424.80	1378.25	1337.50

Decision on option on the basis of profitability :

- (i) If price and cost under proposal (a) is for entire production of C: Proposal (b) of Export
- (ii) If price and cost under proposal (a) is for incremental prod C : Proposal (a) – Option 2

Question 31

What are the applications of incremental/differential costs?

(5 Marks)(May, 2010)

Answer

Applications of Incremental/Differential Cost:

1. Whether to process a product further or not.
2. Dropping or adding a product line.
3. Optimizing investment plan.
4. accepting an additional order from a special customer at lower than existing price.
5. Make or buy decision.
6. Opening a new sales territory or branch.
7. Optimizing investment plan out of multiple alternatives.
8. Submitting tenders.
9. Lease or buy decisions.
10. Equipment replacement decisions.

Question 32

X Ltd. supplies spare parts to an air craft company Y Ltd. The production capacity of X Ltd. facilitates production of any one spare part for a particular period of time. The following are the cost and other information for the production of the two different spare parts A and B:

<i>Per unit</i>	<i>Part A</i>	<i>Part B</i>
<i>Alloy usage</i>	<i>1.6 kgs.</i>	<i>1.6 kgs.</i>
<i>Machine Time : Machine A</i>	<i>0.6 hrs.</i>	<i>0.25 hrs.</i>
<i>Machine Time :Machine B</i>	<i>0.5 hrs.</i>	<i>0.55 hrs.</i>
<i>Target Price (₹)</i>	<i>145</i>	<i>115</i>

Total hours available : Machine A 4,000 hours

Machine B 4,500 hours

Alloy available is 13,000 kgs. @ ₹ 12.50 per kg.

Variable overheads per machine hours:

Machine A : ₹ 80

Machine B : ₹ . 100

You are required to identify the spare part which will optimize contribution at the offered price.

If Y Ltd. reduces target price by 10% and offers ₹ 60 per hour of unutilized machine hour, what will be the total contribution from the spare part identified above?

(8 Marks)(May, 2010)

Answer

(i) Number of parts to be manufactured:

	Part A	Part B
Machine "A" (4,000 hours)	6666	16000
Machine "B" (4,500 hours)	9000	8181
Alloy available (13,000 kgs.)	8125	8125
Maximum number of parts to be manufactured	6666	8125
Cost per unit	₹	₹
Material (12.5 x 1.6)	20.00	20.00
Variable Overhead : Machine "A"	48.00	20.00
Variable Overhead: Machine "B"	50.00	55.00
Total variable cost per unit	118.00	95.00
Price offered	145.00	115.00
Contribution per unit	27.00	20.00

2.58 Advanced Management Accounting

Total contribution for units produced (I)	179982	162500
Spare part A will optimize the contribution		

(ii)

	Part A
Parts to be manufactured numbers	6666
Machine A : to be used	4000
Machine B : to be used	3333
Underutilized machine hours (4500 – 3333)	1167
Compensation for unutilized machine hours (II) (₹ 1167 x 60)	70020
Reduction in price by 10% causing fall in contribution of ₹ 14.50 per unit i.e (₹ 6666 x 14.5) (III)	96657
Total contribution (I + II -III)	153345

Question 33

A company has two divisions : Division a and Division B. Both divisions of the company manufacture the same product but located at two different places. The annual output of division A is 6000 tons (at 80% capacity) and that of division B is 7500 tons (at 60% capacity). The basic raw material required for production is available locally at both the places, but at division A, it is limited to 4000 tons per annum at the rate of ₹ 100 per ton, at division B, it is limited to 8000 tons per annum at the rate of ₹110 per ton. Any additional requirement of material will have to be purchased at a rate of ₹125 per ton from other markets at either of division. Variable costs per ton at each division remain constant. For every 1000 tons of output, 800 tons raw material is required. The details of other costs of the divisions are as follows:

	Division A	Division B
Other variable costs of output (₹)	122 per ton	120 per ton
Fixed cost per annum(₹)	3,80,000	6,00,000

Required:

- Calculate variable cost per ton for each division's product and decide ranking in order to preference.
- The company desires to fully utilize the available local supplies of raw material to save the overall variable cost of production; keeping the total production of both the divisions putting together is the same as at present level. Calculate the quantity of production (output) that could be transferred between the two divisions and overall saving in variable cost.
- After considering the option (ii), how the balance capacity should be utilized if company is working at 100% capacity, and also calculate selling price per ton if company mark up 10% on full cost of each division's product. (12 Marks)(Nov., 2010)

Answer

Variable cost per ton in different alternatives

Particulars	Division A		Division B	
	Local	Outside	Local	Outside
Material per ton	0.8	0.8	0.8	0.8
Rate per ton	100	125	110	125
Cost of material	80	100	88	100
Other Variable cost per ton	122	122	120	120
Total Variable Cost	202	222	208	220
Ranking	I	IV	II	III

Maximum production at both divisions 6000+7500 = 13500 tons

Rank	Division	Market	Material	Output	Total	Balance
						13,500
I	A	Local	4,000	5,000	5,000	8,500
II	B	Local	6,800	8,500	13,500	0
	Total		10,800	13,500		

Statement showing saving in overall variable cost of proposed mix

Production (Current Mix)	Production (tons)	Variable cost per ton	Amount (₹)
Division A from local Market	5,000	202	10,10,000
Division A from outside Market	1,000	222	2,22,000
Division B from local Market	7,500	208	15,60,000
Total Variable Cost of Production	13,500		27,92,000
Production (Proposed Mix)			
Division A from local Market	5,000	202	10,10,000
Transfer from Division A to B as variable cost in Division B is less than other market cost (6000-5000)=1000 output required 800 tons input.	8,500	208	17,68,000
Total Variable Cost of Production	13,500		27,78,000

2.60 Advanced Management Accounting

Transfer from Division A to Division B 1000 tons output will save in variable cost ₹ 2792000-2778000=14000.

At 100% capacity the production is

	Div A	Div B	Total
Output (in tons)	$6000/0.80 = 7,500$	$7500/0.6 = 12,500$	20,000
Output already used	5,000	8,500	13,500
Balance capacity (tons)	2,500	4,000	6,500
Input required (tons)	6,000	10,000	
Input locally available	4,000	8,000	
Input locally used	4,000	6,800	
Balance available (input local)	NIL	1,200	

Rank	Div	Market	Material	Output	Total	Balance Output
						6500
2nd	B	Local	1200	1500	1500	5000
3rd	B	Outside	2000	2500	4000	2500
4th	A	Outside	2000	2500	2500	NIL

Total cost of production and Selling price per tone

	Division A	Amount (₹)	Division B	Amount (₹)
Variable Cost	Output x VC		Output x VC	
Local Material	5000×202	10,10,000	$8500+1500=10000$ $\times 208$	20,80,000
Outside Material	2500×222	5,55,000	2500×220	5,50,000
Fixed Cost		3,80,000		6,00,000
TOTAL COST (full cost)		19,45,000		32,30,000
Profit		1,94,500		3,23,000
Selling Price		21,39,500		35,53,000
Selling Price per tonne		285.27		284.24

Alternative Answer

	Division A		Division B	
	Output	Raw Material	Output	Raw Material
Current production	6,000	4,800	7,500	6,000
Maximum Production	7,500		12,500	
Maximum production from Local Raw material	5,000	4,000	10,000	8,000

	Division A		Division B	
	Local Raw Material	Outside Raw Material	Local Raw Material	Outside Raw Material
Raw material cost per ton of output	80	100	88	100
Variable Overhead per ton of output	122	122	120	120
Total Variable Cost	202	222	208	220
Rank	I	IV	II	III
Current Mix (Output) M	5,000	1,000	7,500	-
Divisional subtotal of output	6,000		7,500	
Maximum Possible Output	5,000	2,500	10,000	2,500
Divisional subtotal of max. output	7,500		12,500	
Proposed optimal mix current output N	5,000	-	8,500	0

Savings in Variable Cost = $1000 \times (222 - 208) = 14,000$

(Difference between rows M and N)

	Division A		Division B	
	Local Raw Material	Outside Raw Material	Local Raw Material	Outside Raw Material
Maximum Prodn Capacity (Output)	5,000	2,500	10,000	2,500
Weighted average Variable Cost per tonne	$\frac{202 \times 2 + 222 \times 1}{3} = 208.67$		$\frac{208 \times 4 + 220 \times 1}{5} = 210.40$	

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	Division A	Division B
Variable Cost per unit	208.67	210.40
Fixed Cost per unit	50.67	48.00
	380000/7500	600000/12500
Total Cost per ton	259.34	258.40
Markup @ 10%	25.93	25.84
Total Selling price per ton	285.27	284.24

Question 34

G Ltd. produces and sells 95,000 units of 'X' in a year at its 80% production capacity. The selling price of product is ₹ 8 per unit. The variable cost is 75% of sales price per unit. The fixed cost is ₹ 3,50,000. The company is continuously incurring losses and management plans to shut-down the plant. The fixed cost is expected to be reduced to ₹1,30,000. Additional costs of plant shut-down are expected at ₹15,000.

Should the plant be shut-down? What is the capacity level of production of shut-down point?

(5 Marks)(Nov., 2010)

Answer

	If plant is continued	If plant is shutdown
Sales	7,60,000	-
Less: Variable Cost	<u>5,70,000</u>	-
Contribution	1,90,000	
Less: Fixed Cost	3,50,000	1,30,000
Additional Cost		<u>15,000</u>
Operating Loss	<u>1,60,000</u>	<u>1,45,000</u>

A comparison of loss figures indicated as above points out that loss is reduced by (16,000-14,500) ₹ 15,000 if plant is shut down.

$$\text{Shut down point} = \frac{3,50,000 - 1,45,000}{8 - 6} = \frac{2,05,000}{2} = 1,02,500 \text{ units}$$

Capacity level of shut down point:

$$\text{At 100\% level production is } \frac{95,000}{0.80} = 1,18,750$$

$$\text{Capacity level at shut down} = \frac{1,02,500}{1,18,750} = 86.32\%$$

Alternative Solution

	₹
If the plant is shut down, the sunk cost or fixed expenses	1,45,000
If it is working at 80% capacity, the fixed cost	3,50,000
Additional fixed expenses	2,05,000
Contribution (95000*2)	1,90,000
Incremental Loss on Continuing	15,000

Decision - better to shut down

Production at shut-down point

$$\begin{aligned}
 2x - 350000 &= 1,45,000 \\
 2x &= 2,05,000 \\
 x &= 1,02,500 \text{ Units} \\
 \text{Capacity \%} &= 1,02,500 / (95,000 / 0.8) = 86.32\%
 \end{aligned}$$

Question 35

E Ltd. manufactures and sells four types of products under the brand names A, B, C and D. On a turnover of ₹ 30 crores in 2009, company earned a profit of 10% before interest and depreciation which are fixed. The details of product mix and other information are as follows:

Products	Mix% to total sales	PV Ratio (%)	Raw material as % on sales value
A	30	20	35
B	10	30	40
C	20	40	50
D	40	10	60

Interest and depreciation amounted to ₹ 225 lakhs and ₹ 115.50 lakhs respectively. Due to increase in prices in the international market, the company anticipates that the cost of raw materials which are imported will increase by 10% during 2010. The company has been able to secure a license for the import of raw materials of a value of ₹ 1,535 lakhs at 2010 prices. In order to counteract the increase in costs of raw materials, the company is contemplating to revise its product mix. The market survey report indicates that the sales potential of each of the products: 'A', 'B' and 'C' can be increased upto 30% of total sales value of 2009. There was no inventory of finished goods or work in progress in both the year.

You are required to :

Set an optimal product mix for 2010 and find the profitability.

(12 Marks)(Nov., 2010)

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Answer

Revised P/V ratio and ranking of products:

Product	Existing P/V ratio %	Increase in Raw material cost as % of sales value	Revised P/V Ratio	Revised raw material as % of sale value	Contribution per ₹ 100 of raw material %	Rank
A	20	3.5	16.5	38.50	42.86%	III
B	30	4	26	44.00	59.09%	II
C	40	5	35	55.00	63.64%	I
D	10	6	4	66.00	6.06%	IV

Maximum Sales potential (₹ In lacs)

A	30 % ₹ 3000	900
B	30 % ₹ 3000	900
C	30 % ₹ 3000	900
D	40 % of 3000	1200

Allocation of raw material whose supply is restricted to ₹ 1535 lacs in order of raw material profitability.

Product	Rank	Sales ₹ In lacs	Raw Material per ₹ 100 Lacs Sales	Raw Material Equired	Balance Raw Material
C	I	900	55	495	1040
B	II	900	44	396	644
A	III	900	38.5	346.5	297.5
D	IV	451**	66	297.5*	0

* Balancing figure, hence sales will be restricted to 451** lakhs (297.5/66%)

Profitability Statement							₹ In Lakhs
Product	Existing (2009)			Proposed(2010)			
	Sales	P/V Ratio	Contribution	Sales	P/V Ratio	Contribution	
A	900	20	180	900	16.5	148.5	
B	300	30	90	900	26	234	
C	600	40	240	900	35	315	
D	1200	10	120	451	4	18.04	
Total	3000		630	3151		715.54	

Less : Fixed Costs*	330	330
Profit before Dep and Int.	300	385.54
Less : Depreciation	225	225.00
Less : Interest	115.5	115.50
Profit before tax	(40.5)	45.04

* Balancing figure(Contribution - Profit before Depreciation & Interest)

The increase of contribution of ₹85.54 in 2010 will set off loss of ₹40.50 lakhs and result in profit of ₹45.04 lakhs.

Question 36

The following information is given by Z Ltd.:

Margin of safety	₹ 1,87,500
Total cost	₹ 1,93,750
Margin of safety	7500 units
Break-even sales	2500 units

Required:

Calculate Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost. (4 Marks)(Nov., 2010)

Answer

$$\begin{aligned} \text{Margin of Safety(\%)} &= \text{MoS Units/Actual Sales Units} \\ &= 7500/(7500+2500) \\ &= 75\% \end{aligned}$$

$$\begin{aligned} \text{Total Sales} &= 187500/0.75 \\ &= ₹ 2,50,000/- \end{aligned}$$

$$\begin{aligned} \text{Profit} &= \text{Total sales} - \text{Total Cost} \\ &= 250000 - 193750 \\ &= ₹ 56250 \end{aligned}$$

$$\begin{aligned} \text{P/V Ratio} &= \text{Profit/MoS (₹)} \times 100 \\ &= 56250/187500 \times 100 = 30\% \end{aligned}$$

$$\begin{aligned} \text{BEP Sales} &= \text{Total Sales} / (100 - \text{MS}) \\ &= 2,50,000 \times 0.25 \\ &= ₹ 62,500 \end{aligned}$$

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$$\begin{aligned}\text{Fixed Cost} &= \text{Sales} \times \text{P/V Ratio} \\ &= 250000 \times 0.30 = 75000 \\ &= 18750\end{aligned}$$

Alternate Answer 1

$$\begin{aligned}\text{Margin of Safety} &= \text{Selling Price per unit} \times (7500 \text{ units}) \\ ₹ 187500 &= \text{Selling Price per unit} \times (7500 \text{ units})\end{aligned}$$

Therefore ,

$$\text{Selling Price per unit} = \frac{187500}{7500} = ₹ 25$$

Profit		₹
Sales	10000×25	2,50,000
Less: Total Cost		1,93,750
Profit		56,250
P/V Ratio	$\frac{\text{Profit/Margin of Safety}}{56250/187500}$	30%
BEP Sales	2500×25	₹ 62,500
Fixed Cost	$62500 \times 30\%$	₹ 18,750

Alternative Answer 2

$$\text{Selling price} = ₹ 187500 / 7500 = ₹ 25$$

$$\text{Total Cost at Break Even point} = ₹ 25 \times 2500 = 62500 = \text{Break Even Sales}$$

$$(\text{Total Cost} - \text{Total Cost of BE}) / (\text{Total Units} - \text{Break Even Units}) = \text{Variable Cost per Unit}$$

$$(1,93,750 - 62,500) / (10,000 - 2,500) = 1,31,250 / 7,500 = ₹ 17.50 \text{ per unit}$$

$$\text{Selling Price} = 25.00$$

$$\text{Variable Cost} = \underline{17.50}$$

$$\text{Contribution} = 7.50$$

$$\text{P/V Ratio} = 7.50 / 25$$

$$= 30\%$$

$$\text{Fixed Cost} = 7.50 \times 2500 \text{ units}$$

$$= ₹ 18750.$$

$$\text{Profit} = 7.50 \times 7500$$

$$= ₹ 56,250$$

Question 37

Calculate the selling price per unit to earn a return of 12% net on capital employed (net of tax @40%). The cost of production and sales of 80,000 units are:

Variable cost including material cost *₹ 9,60,000*

Fixed overheads *₹ 5,00,000*

The fixed portion of capital employed is ₹ 12 lakhs and the varying portion is 50% of sales turnover.
(4 Marks)(Nov., 2010)

Answer

Let 'x' be the selling price per unit, Therefore, Turnover = 80000 x

Capital Employed = 1200000+40000 x

Return on capital employed after tax = 12%

Therefore,

Return on capital employed before tax = 12/0.6

= 20%

Therefore,

Return on capital employed before tax = 20% of (1200000+40000x) = 240000+8000x

Sales	80000 x
Variable Cost	960000
Fixed Cost	500000
Profit	80000x - 1460000

Therefore

$$80000x - 1460000 = 240000 + 8000x$$

$$72000x = 1700000$$

$$X = ₹ 23.61$$

Alternative Answer

Selling price per unit should cover Variable cost unit, Fixed Cost per unit and ROCE per unit

Fixed Capital Employed = ₹ 12 lacs

Required Return (net of tax) = 12% = ₹ 1,44,000

Pre tax return = 1,44,000 / 0.6 = ₹ 2,40,000

Let Selling Price per unit = X

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$$X = (14,60,000 + 2,40,000) / 80,000 + (12\% \text{ of } 50\% \text{ of } X) / 0.6$$

$$= 17,00,000 / 80,000 + 6/100 \times 1/0.6 \times X$$

$$X(1 - 0.1) = 21.25$$

$$X = 21.25 / 0.9 = ₹ 23.61 \text{ per unit}$$

Required Selling price = ₹ 23.61

Question 38

Pick out from each of the following items, costs that can be classified under 'committed fixed costs' or 'discretionary fixed costs'.

- (i) Annual increase of salary and wages of administrative staff by 5% as per agreement
 - (ii) New advertisement for existing products is recommended by the Marketing Department for achieving sales quantities that were budgeted for at the beginning of the year.
 - (iii) Rents paid for the factory premises for the past 6 months and the rents payable for the next six months. Production is going on in the factory.
 - (iv) Research costs on a product that has reached 'maturity' phase in its life cycle and the research costs which may be needed on introducing a cheaper substitute into the market for facing competition.
 - (v) Legal consultancy fees payable for patent rights on a new product Patenting rights have been applied for.
- (5 Marks)(May 2011)**

Answer

Committed Fixed Cost	Discretionary Fixed Cost
(i) Salary and wage increase	(ii) New Advertisement Cost
(iii) Rents payable for the next 6 months	(iv) Research cost for substitutes
(v) Legal fees for filing for patent rights.	

Question 39

A company can make any one of the 3 products X, Y or Z in a year. It can exercise its option only at the beginning of each year.

Relevant information about the products for the next year is given below.

	X	Y	Z
Selling Price (₹/u)	10	12	12
Variable Costs(₹/u)	6	9	7
Market Demand (units)	3000	2000	1000

<i>Production capacity (units)</i>	2000	3000	900
<i>Fixed Costs (₹)</i>			30,000

You are required to compute the opportunity costs for each of the products.

(3 Marks) (May, 2011)

Answer

	X	Y	Z
Contribution per unit	4	3	5
Units (lower of production/ market demand)	2000	2000	900
Possible Contribution (₹)	8000	6000	4500
Opportunity Cost	6000	8000	8000

(Note: Opportunity cost is maximum benefit forgone.)

Question 40

Entertain U Ltd. hires an air-conditioned theatre to stage plays on weekend evenings. One play is staged per evening. The following are the seating arrangements:

VIP rows-the first 3 rows of 30 seats per row, priced at ₹ 320 per seat.

Middle level-the next 18 rows of 20 seats per row priced at ₹ 220 per seat.

Last level -6 rows of 30 seats per row priced at ₹ 120 per seat.

For each evening a drama troupe has to be hired at ₹ 71,000, rent has to be paid for the theatre at ₹ 14,000 per evening and air conditioning and other state arrangements charges work out to ₹ 7,400 per evening. Every time a play is staged, the drama troupe's friends and guests occupy the first row of the VIP class, free or charged, by virtue of passes granted to these guests. The troupe ensures that 50% of the remaining seats of the VIP class and 50% of the seats of the other two classes are sold to outsiders in advance and the money is passed on to Entertain U. The troupe also finds for every evening, a sponsor who puts up his advertisements banner near the stage and pays Entertain U a sum of ₹ 9,000 per evening. Entertain U supplies snacks during though interval free of charge to all the guests in the hall, including the VIP free guests. The snacks cost Entertain U ₹ 20 per person. Entertain U sells the remaining tickets and observes that for every one seat demanded from the last level, there are 3 seats demanded from the middle level and 1 seat demanded from the VIP level. You may assume that in case any level is filled, the visitor busy the next higher or lower level, subject to availability.

(i) *You are required to calculate the number of seats that Entertain U has to sell in order to break-even and give the category wise total seat occupancy at BEP.*

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- (ii) Instead of the given pattern of demand, if Entertain U finds that the demand for VIP, Middle and Last level is in the ratio 2:2:5, how many seats each category will Entertain U have to sell in order to break-even? (11 Marks) (May, 2011)

Answer

- (i) Fixed Costs

		₹	₹
Troupe hire		71,000	
Rent		14,000	
A/C		7,400	
VIP Snacks		<u>600</u>	93,000
Fixed Revenues:			
Seats Sold by the troupe		54,000	
Sponsor's advertisement		<u>9,000</u>	<u>63,000</u>
Net fixed costs recovered by Entertain U to Break even			<u>30,000</u>
Seats Sold by the troupe	54,000		
Sponsor's advertisement	9,000		
		63,000	
	VIP	Med	Lost
Total seats available	90	360	180
Less: Free	30		
Less: Sold by troupe	30	180	90
Can be sold by Entertain U	30	180	90
Row Price	320	220	120
Variable cost	<u>20</u>	<u>20</u>	<u>20</u>
			(Snacks)
Contribution per seat	300	200	100
Demand	1	:	3 : 1

$$= \frac{300 \times 1 + 200 \times 3 + 100 \times 1}{1 + 3 + 1} = \frac{300 + 600 + 100}{5} = \frac{1000}{5} = 200$$

∴ Break Even Point for Entertain U = ₹ $\frac{30,000}{200}$ = 150 No. of seats

	VIP Rows	Middle Level	Last Level	
BF Seats Total 150	30	90	30	
Contribution per unit	300	200	100	
Contribution (₹)	<u>9,000</u>	<u>18,000</u>	<u>3,000</u>	₹ 30,000

Category wise occupancy at Break Even Point

VIP 30+30+30 = 90

Middle = 90+180 = 270

Last = 120

(ii) If demand is in the ratio 2 : 2 : 5

Weighted contribution per seats = $\frac{2 \times 300 + 2 \times 200 + 5 \times 100}{9}$

= $\frac{600 + 400 + 500}{9} = \frac{1500}{9} = \frac{30,000}{1,500} \times 9 = 180$ seats

Ratio	40	40	100
Quantity available	30	180	90
Break Even quantity	30	10	90
		10	10
	30	60	90
Contribution per unit	300	200	100
No. of seats	30	60	90
Contribution ₹	<u>9,000</u>	<u>12,000</u>	<u>9,000</u>

Total = 30,000

Question 41

Maruthi Agencies has received an order from a valuable client for supplying 3,00,000 pieces of a component at ₹ 550 per unit at a uniform rate of 25000 units a month.

Variable manufacturing costs amount to ₹ 404.70 per unit, of which direct materials is ₹ 355 per unit. Fixed production overheads amount to ₹ 30 lacs per annum, including depreciation. There is a penalty/reward clause of ₹ 30 per unit for supplying less/more than 25000 units per month to adhere to the schedule of supply, the company procured a machine worth ₹ 14.20 lacs which will wear out by the end of the year and will fetch ₹ 3.55 lakh at the year end. After this supply of machine, the supplier offers another advanced machine

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which will cost ₹ 10.65 lakhs, will wear out by the year end and not have any resale value. If the advanced machine is purchased immediately, the purchaser will exchange the earlier machine supplied at the price of the new machine. Fixed costs of maintaining the advanced machine will increase by ₹ 14,200/- per month for the whole year. While the old machine had the capacity to complete the production in 1 year, the new machine can complete the entire job in 10 months. The new machine will have material wastage of 0.5%. Assume uniform production throughout the year for both the machines.

Using incremental cost/revenue approach, decide whether the company should opt for the advanced version. (5 Marks) (May, 2011)

Answer

	Old (₹)	New (₹)	Incremental
Depreciation ₹ 14.2 lakhs – ₹ 3.55 lakhs	10,65,000	10,65,000	-
Fixed Cost increase		1,70,400	(-) 1,70,400
Resale value	+3,55,000	-	(-) 3,55,000
Material ₹ /u 355 x .5% 1.775 x 3,00,000		5,32,500	(-) 5,32,500
Increase in Costs in new Machine purchased			(-) 10,57,900
Penalty @ ₹ 30 per unit	-	-	
Reward @ ₹ 30 per unit 5000 per months x 10 months = 50,000 x 30 =			<u>+ 15,00,000</u>
Gain			<u>4,42,100</u>

Decision: Buy the advanced version.

Working Note:

1st machine 25,000 per month, no penalty, no reward

new machine: $\frac{3,00,000}{10} = 30,000$ per months

advance supply per month = 5,000

= 5,000 x 10 months = 50,000 units reward.

Question 42

6000 pen drives of 2 GB to be sold in a perfectly competitive market to earn ₹ 1,06,000 profit, whereas in a monopoly market only 1200 units are required to be sold to earn the same profit.

The fixed costs for the period are ₹ 74,000 . the contribution per unit in the monopoly market is as high as three fourths its variable cost. Determine the targets selling price per unit under each market condition. (4 Marks) (May, 2011)

Answer

	Perfect Competition	Monopoly
Units	6,000	1,200
Contribution (1,06,000 + 74,000)	1,80,000	1,80,000
Contribution per unit	30	150
Variable Cost per unit $150 \div \frac{3}{4}$		200
Variable Cost per unit	200	
Selling Price per unit	230	350

Question 43

New Ltd. Plans to completely manufacture a single product Z., whose selling price and variable manufacturing costs will be ₹ 100 per unit and ₹ 80 per unit respectively. If the complete production is done at its own factory, fixed machining costs will be ₹ 3,62,000 and fixed administration and selling overheads will be ₹ 30,000 for the production period.

Alternatively, the product can be finished outside by sub contracting the machining operations at ₹ 10 per unit, but this will entail an increase in the fixed administration overheads by ₹ 1,20,000 while fully avoiding the machining cost of ₹ 3,62,000

Based on the above figures and assuming a production capacity of 30,000 units for the production period, advise with relevant supporting figures, from a financial perspective, for what volumes of market demand will:

- (i) a manufacture be recommended at all ?
- (ii) a fully in-house production be recommended?
- (iii) the sub contracting option be recommended ?

(5 Marks)(Nov, 2011)

Answer

Details	Options	
	Manufacturing	Sub Contract
	Amount (₹)	Amount (₹)
Selling price	100	100
Variable Cost	80	90
Contribution	20	10

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Fixed Cost	3,92,000	1,50,000
BEP (units)	19,600	15,000

Point of Indifference = level of production where both options will have same outcome.

It can be calculated as :

Difference in Fixed cost = ₹ (3,92,000 – 1,50,000)=₹ 2,42,000

Difference in contribution per unit = ₹ 10

Point of indifference = 2,42,000 /10 = 24,200 units.

It may be calculated in alternative way.

Indifference Point (x): (20x – 392000) = (10x – 150000)

10x = 242000

X = 24200

- (i) If Market demand is above 15000 : manufacture is recommended
- (ii) For Demand 24201 to 30000 units : Manufacture fully in-house.
- (iii) For Demand 15000 to 24200 units : Sub-contract

Question 44

Pigments Ltd. is a chemical factory producing joint product s J, K and L at a joint cost of production of ₹ 9, 60,000. The sales are:

J 60,000 units ₹ at 5 per unit,

K 20,000 units at ₹ 20 per unit and

L 40,000 units at ₹ 10 per unit

The company seeks you advice regarding the following options available:

Option I: *After the joint process, all of L can be further processed to make 36,000 units of M, at an additional processing cost of ₹ 1,80,000 and M can be sold at ₹ 18 per unit.*

Option II: *the facilities used to convert L to M may be used to make 7000 units of an additional product A, with a different raw material input. A can be made at an additional variable manufacturing cost of ₹ 12 per unit and will fetch ₹ 30 as the selling price, but the company will have to offer one unit of J as a free gift for each unit of A sold.*

Evaluate the proposals using the incremental cost approach.

(5 Marks)(Nov, 2011)

Answer

Working Notes:

Particulars	Option – I	Option – II
	Process L to M	Sell new product A
	Amount (₹)	Amount (₹)
Sale of Product M	648,000	
Sale of Product A		210000
(Less: Revenue lost on Product L)	400,000	
(Less: Revenue lost on Product J)		35000
Less: Additional Cost	180,000	84000
Incremental Profit	68000	91000
Decision : Option II is better by ₹ 23000		

Question 45

PQ Ltd, makes two products P and Q, which are similar products with slight difference in dimensions, but use the same manufacturing processes and facilities. P{production may be made interchangeably after altering machine set-up. Production time is the same for both products. The cost structure is as follows:

(Figures ₹ per unit)	P	Q
Selling Price	100	120
Variable manufacturing cost (directly linked to units produced)	45	50
Contribution	55	70
Fixed manufacturing cost	10	10
Profit	45	60

Fixed cost per unit has been calculated based on the total practical capacity of 20,000 units per annum(which is either P or Q both put together). Market demand is expected to be the deciding factor regarding the product mix for the next 2 years. The compny does not stock inventory of finished goods. The company wished to know whether ABC system is to be set up at a cost of ₹ 10,000 per month for the purpose of tracking and recording the fixed overhead costs for allocation to products.

Support your advice with appropriate reasons.

(6 Marks) (Nov, 2011)

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Independent of the above, if you are told to assume that fixed costs stated above, consist of a non-cash component of depreciation to plant at 90,000 for the year, will you advice change? Explain. (2 Marks) (Nov, 2011)

Answer

Working Notes

#	Data	Reasoning	Decision
i.	Similar Products Similar Production Resources	OH Cost based on production units is appropriate. ABC will also yield identical results	ABC system not required for OH allocation
ii.	Present OH Cost = 10/u. Proposed Increase due to ABC system : $120000/20000 = 6/u$	Current OH cost of 10/u will increase by 6 per unit due to installing ABC system (60% increase)	For allocation purpose, ABC not justified
iii.	Both have +ive contribution / u. Market demand determines the mix	OH allocation has no role in decision making	No need for ABC System
iv.	For the purpose of OH allocation, ABC need not be installed. However, if the fixed overheads of ₹ 2,00,000 are analysed by activity and thereby a saving of at least ₹ 1,20,000 be expected (which is the cost of installing ABC system), then, ABC system may be installed		
v.	For the non cash component of depn = 90,000 , FC that can be saved is a maximum of 1,10,000 (2,00,000 – 90,000). Hence, this is clearly less than ABC cost installation. Hence <u>do not install ABC System</u>		

Question 46

Happy Holidays company contracts to take children on excursion trips Relevant information for a proposed excursion trip is given below:

<i>Revenue per trip per child</i>	<i>4000</i>
<i>Expenses that have to be incurred:</i>	
<i>Train fare per child per trip</i>	<i>1700</i>
<i>Meals per child per trip</i>	<i>300</i>
<i>Craft Materials per child per trip</i>	<i>600</i>
<i>Room rent per trip (4 children can be accommodated in a room)</i>	<i>760</i>

Local Transport at picnic spots (per vehicle) (each vehicle can seat 6 children excluding the driver)	1200
--	------

Fixed costs that are required to be covered in a trip ₹ 5,18,130 .

Find the minimum number of children to cross the break-even point and start earning a profit.

(6 Marks) (Nov, 2011)

Answer

Item Description	₹
Revenue per trip	4,000
Less: Variable Cost	
Train Fare	1,700
Meals per Child	300
Craft Materials	600
Total Variable Cost	2,600
Contribution per child	1,400

$$\text{Relevant Range} = \frac{5,18,130}{1010} = 513$$

Step Fixed Cost

Items	₹
Room Rent (760/4)	190
Transport Cost (1200/6)	200
Total Step Fixed Cost	390

Net Contribution = 1400 – 390 = ₹ 1010.

Details	Amount
Sales	4000
Variable Cost	-2600
Contribution	1400

At 513 Students

General Fixed Cost		518,130
Room Rent	129*760	98,040
Transportation	86*1200	103,200
Total Fixed Cost		719,370

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	513*140	
Gross Contribution	0	718,200
Loss		(1,170)

BEP = $513 + 1170/1400 = 513.83$. Hence the Minimum Students will be 514

Relevant Range for Earning Profit will be 514 to 516

Particulars	514	516
General Fixed Cost	518,130	518,130
Room Rent	98,040	98,040
Transportation	103,200	103,200
Total Fixed Cost	719,370	719,370
Gross Contribution	719,600	722,400
Profit	230	3,030

Question 47

Quickcomp is a successful version of a software package that is widely used. Fastercomp is the next version, for which the development is complete and it is ready to be sold immediately in the market as budgeted. However, for Fastercomp, user manuals, training modules and diskettes have not yet been made, whereas, for the Quickcomp version, these are overstocked by 5,000 units. Release of Fastercomp will render the Quickcomp version not saleable.

The following information is provided:

	Quickcomp	Fastercomp
<i>Selling price per unit ₹</i>	14,000	14,000
<i>Variable cost per unit ₹</i> <i>(consisting of user manuals, training modules and diskettes)</i>	1000	4000
<i>Development Cost per unit ₹</i> <i>(total cost of development spread over the expected sales quantity during the product's life-cycle)</i>	7,000	10,000
<i>Marketing/Administration Cost per unit ₹</i> <i>(Fixed budgeted annual outflow divided by the expected sales quantity for each product for the year)</i>	3500	4000
<i>Total Costs per unit ₹</i>	11,500	18,000
<i>Operating Income per unit</i>	2,500	1,000

From a purely financial perspective, the company wants your advice whether to delay the release of the new version by 2 months by when the inventory of the existing version would

have sold out or to release the new version immediately. Support your advice with relevant figures. (6 Marks) (Nov, 2011)

Answer

Particulars	Quickcomp	Fastercomp	Remarks
Sale Price	14,000	19,000	Given
Less:			
Variable Cost	-	4,000	Quickcomp Variable Cost is Sunk cost
Development Cost	-	-	Sunk Cost
Marketing Cost	-	-	Sunk Cost
Profit	14,000	15,000	
Incremental Profit is ₹ 1000/- Unit. Better to Release Fastercomp now in order to get higher profit by ₹ 5000 x 1000 = 50 lacs.			

Question 48

Two companies, H and L, have the same values for turnover and net profit and make a similar product. H has a higher P/V ratio than L. Which company will perform better when: (i) the market demand is high? (ii) the market demand is low? (2 Marks) (Nov, 2011)

Answer

- (i) In case Market Demand is High – Product H (Lower Variable Cost and Higher Fixed Cost)
- (ii) In case Market Demand is Low – Product L

Question 49

A company has decided to launch a new product X which is, expected to have demand of 10,000 units during the year at ₹160 per unit. The following information is furnished by the company:

- (i) Material - The manufacture of one unit of X requires one unit of each of materials A, B and C.

Raw Material	Current stock (units)	Cost per unit (₹)		
		Original cost	Current Purchase Price	Resale Value
A- Regularly being used	10,000	16	20	14
B- Old stock (Not in use)	6,000	28	24	8

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C- New stock	---	---	48	---
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(ii) Direct labour

Skilled labour is paid at ₹80 per hour. It takes 0.25 hours/unit. Skilled labour has to be drawn from another production line which has a contribution of ₹ 240 per unit, with each unit requiring 2 hours of skilled labour.

Unskilled labour - 2 hours/unit @ ₹ 56 per hour. There is abundant Unskilled labour in the factory, but according to an agreement with the labour union, no unskilled worker can be retrenched.

(iii) Variable overhead - ₹ 10 per unit.

(iv) Fixed Costs –no increase.

Using relevant cost approach, you are required to find out the average variable cost per unit of X. (5 Marks)(May 2012)

Answer

Average variable cost per unit of X

Cost Element	Relevancy		Total Cost (10,000 units) ₹	Average Cost per unit ₹
Raw material A	Replacement Cost	Current Purchase price	2,00,000	20.00
Raw material B	Opportunity Cost	Opportunity Cost (6,000 units * ₹8 per unit)	48,000	
Raw material B	Incremental Cost	Current Purchase Price (4000 units * ₹24 per unit)	96,000	
		Sub total- Raw material B	1,44,000	14.40
Raw material C	Incremental Cost	Current Purchase Price (10,000 units * ₹48 per unit)	4,80,000	48.00
Skilled Labour	Opportunity Cost	$10,000 \times 0.25 \times 240/2 + 10,000 \times 0.25 \times ₹80$	5,00,000	50.00
Unskilled Labour	Sunk Cost		NIL	NIL
Variable Overhead	Incremental	10,000* ₹10 per		

	Cost	unit	<u>1,00,000</u>	<u>10.00</u>
		TOTAL	<u>12,24,000</u>	<u>142.40</u>

Question 50

XY Ltd. makes two products X and Y, whose respective fixed costs are F_1 and F_2 . You are given that the unit contribution of Y is one-fifth less than the unit contribution of X, that the total of F_1 and F_2 is ₹ 1,50,000, that the BEP of X is 1,800 units (for BEP of X F_2 is not considered) and that 3,000 units is the indifference point between X and Y. (i.e. X and Y make equal profits at 3,000 unit volume, considering their respective fixed costs). There is no inventory build up as whatever is produced is sold.

You are required to find out the values F_1 and F_2 and units contributions of X and Y.

(5 Marks)(May,2012)

Answer

Let C_x be the Contribution per unit of Product X.

Therefore Contribution per unit of Product Y = $C_y = 4/5 C_x = 0.8 C_x$

Given $F_1 + F_2 = 1,50,000$,

$F_1 = 1,800 C_x$ (Break even volume * contribution per unit)

Therefore $F_2 = 1,50,000 - 1,800 C_x$.

$3,000 C_x - F_1 = 3,000 * 0.8 C_x - F_2$ or $3,000 C_x - F_1 = 2,400 C_x - F_2$ (Indifference point)

i.e., $3,000 C_x - 1,800 C_x = 2,400 C_x - 1,50,000 + 1,800 C_x$

i.e., $3,000 C_x = 1,50,000$, Therefore $C_x = ₹ 50/-$ ($1,50,000 / 3,000$)

Therefore Contribution per unit of X = ₹ 50

Fixed Cost of X = $F_1 = ₹ 90,000$ ($1,800 * 50$)

Therefore Contribution per unit of Y is ₹ $50 * 0.8 = ₹ 40$ and

Fixed cost of Y = $F_2 = ₹ 60,000$ ($1,50,000 - 90,000$)

The value of $F_1 = ₹ 90,000$, $F_2 = ₹ 60,000$ and X = ₹ 50 and ₹ 40

Question 51

A company is operating at 60 % of its capacity with a turnover of ₹ 43.20 lacs. If the company works at 100 % capacity, the sales-cost relation is:

Factory cost is two thirds of sales value. Prime cost is 75% of factory cost. Administration and selling expenses (75% variable) are 20% of the sales value. Factory overhead will vary according to operating capacity as given below:

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Operating capacity (%)	60	80	100	120
Factory overheads (₹in lacs)	9.90	10.80	12	15

The company has planned to operate at 80 % of its capacity. Moreover, it has received an export order and its execution will involve 40 % of the capacity.

The prime cost of the order is estimated at ₹ 6.0 lacs and the shipping involved will be around ₹ 1.0 lac. Administration and selling expenses will be avoided on the export order. Taking the same percentage of profits as on the domestic sales, determine the minimum price to be quoted for the export order. (8 Marks)(May, 2012)

Answer

	Capacity	
	80% (Domestic sale)	40% (Export order)
	₹ in lakhs	
Sales Value	57.60	
Prime cost (50% of Sales Value i.e., $2/3 \times 75\%$)	28.80	6.00
Fixed Cost (Factory Overheads, as given)	10.80	4.20
Administration and selling - variable ($20\% \times 75\% = 15\%$ of Sales Value)	8.64	
- fixed	3.60	
Shipping		1.00
Total Cost	51.84	11.20
Profit	5.76	
Add : Profit (Domestic Profit @80% Capacity = 10% of Sales. Hence 11.11% on Cost)		1.24
Minimum Export price		12.44

Question 52

Ezee Ltd makes two products, E and Z. All units produced are sold. There is no inventory build up. Production facilities may be used interchangeably for both the products. Sales units are the limiting factor. The following information is given:

	Price Level			Proposed increase
	E	Z	Total	Total
Contribution ₹/units	25	20		
Fixed Cost ₹			46,000	47,500
Sales units (nos)	3,000	2,000	5,000	4,000

For increase in quantities above 4,000 units for each product, there will be an increase in variable selling costs, (for the increased portion only), thereby reducing the contribution per unit to the following figures:

Units	Contribution per unit (₹)	
	E	Z
4001-5000	20	15
5001-6000	15	10
Above 6000	No Sales possible	

- (i) For the present level, find the break-even point with the present product
- (ii) What is the minimum number of incremental units to be sold to recover the additional fixed cost off ₹ 47,500 to be incurred? (Present product mix need not be maintained):
- (iii) If you are allowed to choose the best product mix for the incremental level, (while taking the present mix given in the first table above for the present level), what would be the individual product quantities and the corresponding total contributions, the total average contribution per unit and the total profits for the complete production?

(8 Marks)(May'12)

Answer

- (i) Present Level:

Weighted average contribution per unit

$$(3,000 \times 25 + 2,000 \times 20)/(3,000+2,000) \text{ Or, } (3 \times 25 + 2 \times 20)/(2+3) = 23 \text{ ₹/unit.}$$

BEP = Present level Fixed cost/ weighted average Contribution per unit

$$= 46,000/23 = 2000 \text{ units.}$$

or (E 1200 units & Z 800 units)

- (ii) Minimum units for incremental level:

next 1,000 units of E get contribution of 25 x 1000 = 25,000

next 1,000 units of E or Z get 20/unit as Contribution = 20,000

next 125 units of E or Z get 20/unit as Contribution = 2,500

Total 2,125 units are the minimum requirement for 47,500

incremental fixed cost

Minimum units required:

E	Z	Total
2,000	125	2,125
or		
1,000	1,125	2,125

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(iii) Optimal profit – best mix:

	Product E		Product Z		Total quantity
	Units	Contribution/u	Units	Contribution/u	
Present	3,000	25	2,000	20	5,000
Next	1,000	25			1,000
Next	1,000	20	1,000	20	2,000
Next	-	-	1,000	20	1,000
Total for best mix	5,000		4,000		
Contribution value (₹)	4,000 x 25 + 1,000 x 20 = 1,20,000		4,000 x 20 = 80,000		2,00,000
Average Contribution per unit (₹) = 2,00,000 / 9,000 = 22.22					
Maximum profits (₹) = 2,00,000 – 93,500 = 1,06,500					

Question 53

A machine manufacturing company needs four components A, B, C and D.

The components may be procured from outside. The cost, market price for the components and other information are given below.

Number of units required	3,000	3,500	2,000	3,000
	Figs. ₹ per unit			
	A	B	C	D
Direct Material	120	140	150	120
Direct Wages	60	80	120	80
Direct expenses at ₹40 per machine hour	80	60	80	80
Fixed Cost	40	40	30	50
Total Cost	300	320	380	330
Market Price	300	320	400	270

There are constraints on the machine time in manufacturing all the components. Total machine hours available is only 12,000 hours.

It is possible to use the machine time in a second shift which will attract 20 % extra wages and other fixed overheads at ₹6,000 for every 1,000 hours or part thereof.

With relevant supporting figures, advise the best course of action to maximize the profits.

(Note: Students need not work out the complete profitability statement). (8 Marks)(May'12)

Answer

	A	B	C	D
Quantity	3,000	3,500	2,000	3,000
Market price (₹)	300	320	400	270
Total Variable cost/unit (₹)	260	280	350	280
Contribution per unit (₹)	40	40	50	(10)*
*Decision: do not make D				
Machine Hours per unit	2	1.5	2	
Contribution per Machine Hour	20	26.67	25	
Ranking	III	I	II	
Hours required	6,000	5,250	4,000	15250 total hours
Allocation of Available hours	2,750**	5,250	4,000	12,000 hours
**(Balancing figure)				

Hours required in 2nd Shift 3250 hours 1625 units of A

Contribution per unit for Product A in second shift

₹ 40 – ₹12 = ₹ 28 (Direct wages will go up by ₹12)

For every 1000 hours in second shift the Contribution from A would be

₹14,000 i.e., 1,000/2 * 28

The increase in Fixed Cost is ₹6,000. After 3,000 hours the Contribution will be only ₹ 250/2 * 28 i.e. ₹3,500, whereas the increase in fixed cost will be ₹6,000. Hence it is not advantageous to go beyond 3,000 hours in the second shift.

Best Course of action:

- (i) Purchase D from outside: 3,000 units.
- (ii) Make B and C fully in-house in the normal shift, B:3,500 units, C:2,000 units.
- (iii) Make and buy A as follows:
 - Normal shift: 1,375 units
 - 2nd shift: 1,500 units
 - Purchase: 125 units

Question 54

If Moonlite Limited operates its plant at normal capacity it produces 2,00,000 units from the plant 'Meghdoot'. The unit cost of manufacturing at normal capacity is as under:

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	₹
Direct material	65
Direct labour	30
Variable overhead	33
Fixed overhead	<u>7</u>
	<u>135</u>

Direct labour cost represents the compensation to highly-skilled workers, who are permanent employees of the company. The company cannot afford to lose them. One labour hour is required to complete one unit of the product.

The company sells its product for ₹ 200 per unit with variable selling expenses of ₹ 16 per unit. The company estimates that due to economic down turn, it will not be able to operate the plant at the normal capacity, at least during the next year. It is evaluating the feasibility of shutting down the plant temporarily for one year.

If it shuts down the plant, the fixed manufacturing overhead will be reduced to ₹ 1,25,000. The overhead costs are incurred at a uniform rate throughout the year. It is also estimated that the additional cost of shutting down will be ₹ 50,000 and the cost of re-opening will be ₹ 1,00,000.

Required:

Calculate the minimum level of production at which it will be economically beneficial to continue to operate the plant next year if 50% of the labour hours can be utilized in another activity, which is expected to contribute at the rate of ₹ 40 per labour hour. The additional activity will relate to a job which will be off-loaded by a sister company only if the company decides to shut down the plant.

(Assume that the cost structure will remain unchanged next year. Ignore income tax and time value of money)

(5 Marks) (Nov,2012)

Answer

Contribution per unit

Particulars	(₹)
Selling Price	200
Variable Cost (₹ 65 + ₹ 33 + ₹ 16)	114
Contribution per unit (Excluding direct labour, considered irrelevant and fixed)	86

Savings and earnings if the plant is shut down

Particulars	₹
Savings in Fixed Cost (₹ 14,00,000* – ₹ 1,25,000)	12,75,000
Contribution from Alternate Activity (₹ 40 x 50% of 2,00,000 hrs)	40,00,000

Shutting Down and Reopening Cost (₹ 50,000 + ₹100,000)	(1,50,000)
Total	51,25,000

* [2,00,000 units x ₹ 7]

Indifference Point: ₹51,25,000 / ₹86 = 59,593 units

Minimum level of production to justify continuation = 59,594 units

Question 55

"Sunk cost is irrelevant in decision making, but all irrelevant costs are not sunk costs." Explain with examples. (4 Marks)(Nov, 2012)

Answer

Sunk costs are costs that have been created by a decision made in the past and that cannot be changed by any decision that will be made in the future.

Example, the written down value of assets previously purchased are sunk cost. Sunk costs are not relevant for decision making because they are past cost.

But not all irrelevant costs are sunk cost. For example, a comparison of two alternative production methods may result in identical material costs for both the alternatives. In this case, the direct material cost will remain the same whichever alternative is chosen. In this situation, through direct material cost is the future cost to be incurred in accordance with the production, it is irrelevant, but it is not a sunk cost.

Irrelevant is only with respect to alternatives being considered and not for fund flows whereas for sunk cost there is no further cash flow. Cash flows have already been incurred.

Question 56

A process industry unit manufactures three joint products: A, B and C. C has no realisable value unless it undergoes further processing after the point of separation. The cost details of C are as follows:

	<i>Per Unit</i>
	₹
<i>Upto point of separation</i>	
<i>Marginal cost</i>	30
<i>Fixed Cost</i>	20
<i>After point of separation</i>	
<i>Marginal cost</i>	15
<i>Fixed cost</i>	5
	70

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C can be sold at ₹ 37 per unit and no more.

- (i) *Would you recommend production of C?*
 (ii) *Would your recommendation be different if A, B and C are not joint products?*

(5 Marks)(May, 2013)

Answer

- (i) Cost incurred on Product 'C' *upto point of separation* is irrelevant for decision making as Product 'C' is a Joint Product. Joint Products are the result of same raw material & same process Operations.

Cost incurred *after point of separation* will be considered for decision making as *specifically* incurred for Product 'C'.

After further processing Product 'C' will *contribute* ₹17 per unit toward 'Joint Production Cost'.

Calculation is as follows:

Particulars	Amount (₹)	Amount (₹)
Selling Price <i>per unit</i>		37.00
Less: Cost after separation:		
Marginal Cost <i>per unit</i>	15.00	20.00
Fixed Cost <i>per unit</i>	5.00	
Contribution toward 'Joint Production Cost'		17.00

Hence, *further processing* of Product 'C' is recommended.

- (ii) If Product 'C' is not a joint product with same cost structure. In this case there will be *negative contribution* on production of Product 'C'. The calculation is as follows:

Particulars	Amount (₹)
Selling Price <i>per unit</i>	37.00
Less: Marginal Cost (₹ 30 + ₹ 15)	45.00
Contribution	(8.00)

Hence, production of Product 'C' will not be recommended.

Question 57

HTM Ltd., by using 12,00,000 units of a material M produces jointly 2,00,000 units of H and 4,00,000 units of T. The costs and sales details are as under:

<i>Direct Material M @ ₹ 5 per unit</i>	₹ 60,00,000
---	----------------

Other variable costs	42,00,000
Total fixed costs	18,00,000
Selling price of H per unit	25
Selling price of T per unit	20

The company receives an additional order for 40,000 units of T at the rate of ₹ 15 per unit. If this order has been accepted, the existing price of T will not be affected. However, the present price of H should be reduced evenly on the entire sale of H to market the additional units to be produced.

Find the minimum average unit price to be charged on H to sustain the increased sales.

(5 Marks)(May, 2013)

Answer

Product H & T are joint products and produced in the ratio of 1:2 from the same direct material- M.

Production of 40,000 additional units of T results in production of 20,000 units of H.

Calculation of contribution under existing situation

Particulars	Amount (₹)	Amount (₹)
Sales Value:		
H – 2,00,000 units @ ₹ 25 per unit	50,00,000	
T – 4,00,000 units @ ₹ 20 per unit	<u>80,00,000</u>	1,30,00,000
Less: Material- M (12,00,000 units @ ₹ 5 per unit)		60,00,000
Less: Other Variable Costs		42,00,000
Contribution		<u>28,00,000</u>

Let Minimum Average Selling Price *per unit* of H is ₹ X

Calculation of contribution after acceptance of additional order of 'T'

Particulars	Amount (₹)	Amount (₹)
Sales Value:		
H – 2,20,000 units @ ₹ X per unit	2,20,000 X	
T – 4,00,000 units @ ₹ 20 per unit	80,00,000	
40,000 units @ ₹ 15 per unit	<u>6,00,000</u>	2,20,000 X + 86,00,000
Less: Material- M (12,00,000 units x 110%) @ ₹ 5 per unit		66,00,000
Less: Other Variable Costs (₹ 42,00,000 x 110%)		46,20,000
Contribution		<u>2,20,000 X – 26,20,000</u>

Minimum Average Selling Price *per unit* of H

Contribution after additional order of T = Contribution under existing production

$$\begin{aligned} \Rightarrow 2,20,000 X - 26,20,000 &= 28,00,000 \\ \Rightarrow 2,20,000 X &= 54,20,000 \\ \Rightarrow X &= \frac{54,20,000}{2,20,000} = ₹ 24.64 \end{aligned}$$

Minimum Average Selling Price *per unit* of H is ₹ 24.64

Question 58

X Ltd. wants to replace one of its old machines. Three alternative machines namely M₁, M₂ and M₃ are under its consideration. The costs associated with these machines are as under:

	M ₁	M ₂	M ₃
	₹	₹	₹
Direct material cost p.u.	50	100	150
Direct labour cost p.u.	40	70	200
Variable overhead p.u.	10	30	50
Fixed cost p.a.	2,50,000	1,50,000	70,000

You are required to compute the cost indifference points for these alternatives. Based on these points suggest a most economical alternative machine to replace the old one when the expected level of annual production is 1,200 units. (5 Marks)(May, 2013)

Answer

Computation of Cost Indifference Points *for three alternatives*

Cost Indifference Point of *two machines* = $\frac{\text{Difference in Fixed Cost}}{\text{Difference in Variable Cost per unit}}$

$$\begin{aligned} \text{Machine M}_1 \text{ \& M}_2 &= \frac{₹ 2,50,000 - ₹ 1,50,000}{(₹ 100 + ₹ 70 + ₹ 30) - (₹ 50 + ₹ 40 + ₹ 10)} \\ &= \frac{₹ 1,00,000}{₹ 100} = 1,000 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Machine M}_2 \text{ \& M}_3 &= \frac{₹ 1,50,000 - ₹ 70,000}{(₹ 150 + ₹ 200 + ₹ 50) - (₹ 100 + ₹ 70 + ₹ 30)} \\ &= \frac{₹ 80,000}{₹ 200} = 400 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Machine } M_1 \text{ \& } M_3 &= \frac{\text{₹ } 2,50,000 - \text{₹ } 70,000}{(\text{₹ } 150 + \text{₹ } 200 + \text{₹ } 50) - (\text{₹ } 50 + \text{₹ } 40 + \text{₹ } 10)} \\ &= \frac{\text{₹ } 1,80,000}{\text{₹ } 300} = 600 \text{ units} \end{aligned}$$

From the above computations, it is clear that at activity level below the indifference point the alternative (machine) with lower fixed cost and higher variable costs should be used. In case the activity level exceeds the indifference point, a machine with lower variable cost per unit (or higher contribution per unit) and higher fixed cost, is more profitable to operate.

At the activity level equal to the indifference point both machines are on equal footing. Hence from the above we conclude as follows:

Activity Level	Machine Preference
Less than 400 units	M ₃
Exactly 400 units	Either M ₂ or M ₃
Above 400 units but less than 1,000 units	M ₂
Exactly 1,000 units	Either M ₁ or M ₂
Above 1,000 units	M ₁

When expected level of activity is 1,200 units i.e. more than 1,000 units, Machine M₁ should be used.

Question 59

A company has to decide whether to accept a special order or not for a certain product M in respect of which the following information is given:

<i>Material A required</i>	<i>5,000 kg</i>	<i>Available in stock. It was purchased 5 years ago at ₹ 35 per kg. If not used for M, it can be sold as scrap @ ₹ 15 per kg.</i>
<i>Material B required</i>	<i>8,000 kg</i>	<i>This has to be purchased at ₹ 25 per kg from the market.</i>
<i>Other hardware items</i>	<i>₹ 10,000</i>	<i>To be incurred</i>
<i>Dept X - Labour oriented</i>	<i>5 men for 1 month @ ₹ 7,000 per month per man</i>	<i>Labour to be freshly hired. No spare capacity available.</i>
<i>Dept Y - Machine oriented</i>	<i>3,000 machine hours @ ₹ 5 per machine hour</i>	<i>Existing spare capacity may be used.</i>
<i>Patten and Specification</i>	<i>₹ 15,000</i>	<i>To be incurred for M, but after the order, it can be sold for ₹ 2,000</i>

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Considering relevant costs, find out the minimum value above which the company may accept the order. (5 Marks)(Nov, 2013)

Answer

Determination of Minimum Value of Special Order (considering relevant cost)

Cost Element	Relevant / Irrelevant	Calculation	Amount (₹)
Material – A	Realisable value is relevant.	5,000 Kg. × ₹15	75,000
Material – B	Relevant as it has to be purchased.	8,000 Kg. × ₹25	2,00,000
Other hardware items	Relevant as it is to be incurred.	----	10,000
Dept X – Labour oriented	Relevant as fresh labours are to be hired.	5 men × 1 month × ₹7,000	35,000
Dept Y – Machine oriented	Irrelevant, as spare capacity is available.	----	----
Pattern and Specification	Relevant, Net cost after considering its resale value.	₹ 15,000 – ₹ 2,000	13,000
Minimum Value of Special Order			3,33,000

Question 60

A company can produce any of its 4 products, A, B, C and D. Only one product can be produced in a production period and this has to be determined at the beginning of the production run. The production capacity is 1,000 hours. Whatever is produced has to be sold and there is no inventory build-up to be considered beyond the production period. The following information is given:

	A	B	C	D
Selling Price (₹/unit)	40	50	60	70
Variable Cost (₹/unit)	30	20	20	30
No. of units that can be sold	1,000	600	900	600
No. of production hours required per unit of product.	1 hour	1 hour and 15 minutes	1 hour and 15 minutes	2 hours

What are the opportunity costs of A, B, C and D?

(5 Marks)(Nov.,2013)

Answer

Statement Showing Calculation of Opportunity Cost

Product	A	B	C	D
Selling Price (₹ per unit)	40	50	60	70
Variable Cost (₹ per unit)	30	20	20	30

Contribution (₹ per unit) ...[A]	10	30	40	40
Demand (units)	1,000	600	900	600
No. of Units can be Produced (within 1,000 hours of production capacity)	1,000 $\left(\frac{1,000\text{hrs.}}{1\text{hr.}}\right)$	800 $\left(\frac{1,000\text{hrs.}}{1.25\text{hr.}}\right)$	800 $\left(\frac{1,000\text{hrs.}}{1.25\text{hr.}}\right)$	500 $\left(\frac{1,000\text{hrs.}}{2\text{hr.}}\right)$
No. of Units can be Sold (lower of demand and production) [B]	1,000	600	800	500
Possible contribution of product (₹) ...[A] × [B]	10,000	18,000	32,000	20,000
Opportunity Cost*	32,000	32,000	20,000	32,000

(*) Opportunity cost is the maximum possible contribution foregone by not producing alternative products i.e. if product A is produced then opportunity cost will be maximum of possible contribution from product B,C and D i.e. ₹ 32,000. Same is for Product B and D. In case of product C opportunity cost will be the maximum of possible contribution from product A, B and D i.e. ₹ 20,000.

Question 61

State the type of cost in the following cases:

- (i) Cost associated with the acquisition and conversion of material into finished product.
- (ii) Cost arising from a prior decision which cannot be changed in the short run.
- (iii) Increase in cost resulting from selection of one alternative instead of another.
- (iv) Rent paid for a factory building which is temporarily closed. (4 Marks)(Nov, 2013)

Answer

Cases	Type of Cost
(i) Cost associated with the acquisition and conversion of material into finished product.	Product Cost
(ii) Cost arising from a prior decision which cannot be changed in the short run.	Committed Cost
(iii) Increase in cost resulting from selection of one alternative instead of another.	Differential/Incremental Cost
(iv) Rent paid for a factory building which is temporarily closed.	Shut Down Cost

Question 62

PQR Ltd., a manufacturer of tool kits has just completed XY's domestic order of 100 kits at a price of ₹ 1,650 per kit. The details of cost for XY's order are:

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	Cost (₹)
Direct Material	90,000
Direct Labour	32,000
Tools and Consumables	16,400
Variable overheads	9,600
Fixed overheads (allocated)	15,000
Total	1,63,000

The company wishes to evaluate a special export order from Expo Ltd. of similar 300 kits at ₹ 1,600 per kit. For the export order, special packing has to be done at ₹ 20 per kit. An additional fixed inspection cost specific to this export order has to be incurred. The allocation of fixed overheads will be revised to increase by ₹ 25,000. Tools and Consumables above include special purpose tools costing ₹ 10,000 incurred for XY's order and these can be reused for the export order and the remaining portion is variable. PQR Ltd. wishes to accept the export order at 10% profit on the selling price.

What should be the maximum amount that can be incurred as inspection cost for making such an acceptance possible?

If Expo Ltd. offers to take the products without inspection, what is the maximum discount (as a percentage of the existing export price) that PQR Ltd. can offer to retain its 10% profit on the revised selling price? (Round off calculations to two decimal places). (5 Marks) (May, 2014)

Answer

Statement Showing Permissible Cost *per kit*

Items of Cost	(₹)
Direct Material $\left(\frac{₹90,000}{100\text{ kits}}\right)$	900
Direct Labour $\left(\frac{₹32,000}{100\text{ kits}}\right)$	320
Consumables $\left(\frac{₹16,400 - ₹10,000}{100\text{ kits}}\right)$	64
Variable Overheads $\left(\frac{₹9,600}{100\text{ kits}}\right)$	96
Existing Variable Cost <i>per kit</i>	1,380
Add: Special Packing Cost <i>per kit</i>	20
Total Variable Cost <i>per kit</i>	1,400

Export Offer Price <i>per kit</i>	1,600
Less: Expected Profit (10% on Selling Price)	160
Total Permissible Cost <i>per kit</i>	1,440

Maximum Inspection Cost *per kit* for making export offer acceptable is ₹40

$$\dots (\text{₹}1,440 - \text{₹}1,400)$$

As Total Cost excluding Inspection Cost is ₹1,400 so the Selling Price will be ₹1,555.56

$$\dots \left(\text{₹}1,400 \times \frac{100}{90} \right)$$

Maximum Possible Discount on the Revised Selling Price is ₹ 44.44

$$\dots (\text{₹}1,600 - \text{₹}1,555.56)$$

Percentage of Discount is 2.77%

$$\dots \left(\frac{\text{₹}44.44}{\text{₹}1,600} \times 100 \right)$$

Hence Maximum Discount of 2.78 *percent* can be offered to retain 10% Profit on the Revised Selling Price.

Allocated Fixed Overheads amounting to ₹ 25,000 and Reusable Special Tools amounting to ₹10,000 are *irrelevant* and hence ignored in the *decision making process*.

 This question can be solve by 'Total Cost & Revenue' approach.

Question 63

A company processes different products from a certain raw material. The raw material is processed in process I (where normal loss is 10% of input) to give products A and B in the ratio 3 : 2. B is sold directly. A is processed further in process II (where normal loss is 12.5% of output) to give products C and D in the ratio 5:3. At this point C and D have sale values ₹ 55 and ₹ 40 per kg respectively. C can be processed further in process III with processing cost ₹ 3,95,600 and normal wastage 5% of input and then be sold at ₹ 66 per kg. D can be processed further in process IV with processing cost ₹ 3,82,500 and normal wastage 12.5% of output and then be sold at ₹ 55 per kg. The normal wastage of each process has no realizable value. During the production period, 2,00,000 kgs of raw material is to be introduced into Process I.

Using incremental cost-revenue approach, advise whether sale at split off or further processing is better for each of the products C and D. (5 Marks) (May, 2014)

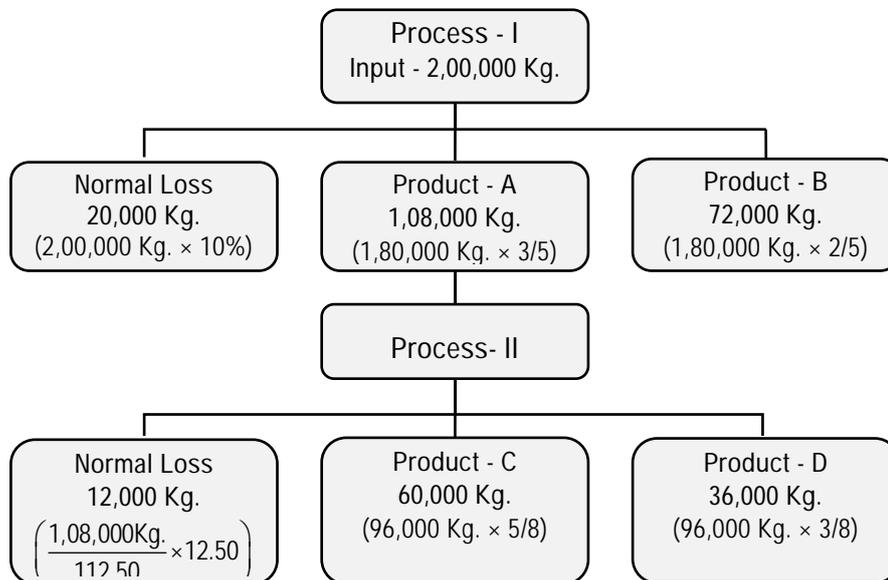
Answer

Statement Showing Decision on Sale at - Split-off Point or After Further Processing

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Product	Product - C	Product - D
Quantity at Split off Point (Kg.)	60,000	36,000
Selling Price at Split off Point (₹)	55	40
Sales Revenue (₹) ... [A]	33,00,000 (60,000 Kg. × ₹55)	14,40,000 (36,000 Kg × ₹40)
Quantity if Processed Further (Kg.)	57,000 (60,000 Kg. × 95%)	32,000 $\left(\frac{36,000\text{Kg.} \times 100}{112.5}\right)$
Selling Price (₹) <i>per unit</i>	66	55
Sales Revenue (₹) ...[B]	37,62,000 (57,000 Kg. × ₹66)	17,60,000 (32,000 Kg. × ₹55)
Incremental Revenue ...[C] = [B] - [A]	4,62,000	3,20,000
Incremental Cost (₹) ...[D]	3,95,600	3,82,500
Profit / (Loss) ...[C] - [D]	66,400	(62,500)
Decision	Process Further	Sale at Split-off Point

Workings:



☞ It is not necessary to show above presentation.

Question 64

AXE Ltd. manufactures four products A, B, C and D. The following details are available for a production period:

	A	B	C	D
Selling price	100	109	121	124
Material cost	40	42	46	40
Labour cost				
Assembly Dept. @ ₹ 10 per hour	15	20	15	20
Machine Dept. @ ₹ 12 per hour	18	24	36	30
Variable overheads @ ₹ 4 per labour hour in assembly dept.	6	8	6	8
Maximum external demand (units)	40,000	55,000	36,000	30,000

Total fixed cost is dependent on the output level and is tabulated below at different levels of output:

Production units (any combination of one or more of any A, B, C or D)	Total fixed cost (₹)
Zero to 1,00,000 units	8,43,000
1,00,001 to 1,50,000 units	12,50,000
1,50,001 to 2,00,000 units	16,00,000

Production facilities can be interchangeably used among the products.

Labour availability in the assembly department is limited to 2,20,000 hours for the production period. A local firm has offered to make any quantity of any of the products on a sub-contract basis at the following rates:

	A	B	C	D
Sub-contract Price (₹/unit)	85	95	101	100

- Advise the management on how many units of each product are to be manufactured or subcontracted to fulfill maximum market demand. What would be the corresponding profits?
- What is the minimum number of units to be produced to achieve break-even point?
- What would you advise as the best strategy to maximize profits if assembly labour is not a limiting factor and if there is no compulsion to fulfill market demand?

(Only relevant figures need to be discussed. A detailed profitability statement is not required).

(10 Marks) (May, 2014)

Answer

(i) Assembly Labour is a Limiting Factor & *to fulfill* Maximum Market Demand:

Statement Showing Contribution *per unit* as well as
Contribution *per assembly hour*

	Demand (Units)			
	40,000	55,000	36,000	30,000
	A	B	C	D
Selling Price (₹/u)	100	109	121	124
Material Cost (₹/u)	40	42	46	40
Labour Cost (₹/u)				
Assembly Dept.	15	20	15	20
Machine Dept.	18	24	36	30
Variable Overheads (₹/u)	6	8	6	8
Contribution (₹/u)	21	15	18	26
Assembly Hours <i>per unit</i>	1.5	2	1.5	2
Contribution (₹/hr.)	14	7.5	12	13
Rank [Contribution (₹/hr.)]	I	IV	III	II
Sub-Contract Price (₹/u)	85	95	101	100
Contribution (₹/u) [Sub-Contract]	15	14	20	24

It is more profitable to *sub-contract C*, since contribution is higher in sub-contracting.

Allocation of Assembly Hours *on the basis of ranking*

Produce A <i>as much as possible</i>	=	40,000 units
Hours Required	=	60,000 hrs (40,000 units × 1.5 hrs.)
Balance Hours Available	=	1,60,000 hrs (2,20,000 hrs. – 60,000 hrs.)
Produce the Next Best	=	30,000 units of D
Hours Required	=	60,000 hrs (30,000 units × 2 hrs.)
Balance Hours Available	=	1,00,000 hrs (1,60,000 hrs. – 60,000 hrs.)
Produce the Next Best	=	50,000 units of B $\left(\frac{1,00,000 \text{ hrs}}{2 \text{ hrs/u}} \right)$

Statement Showing Profit *on the basis of ranking*

Product	Particulars	Contribution/unit (₹)	Contribution (₹)
A	Produce: 40,000 units	21	8,40,000
	Subcontract: NIL units	15	---
B	Produce: 50,000 units	15	7,50,000
	Subcontract: 5,000 units	14	70,000
C	Produce: NIL units	18	---
	Subcontract: 36,000 units	20	7,20,000
D	Produce: 30,000 units	26	7,80,000
	Subcontract: NIL units	24	---
Total Contribution			31,60,000
Less: Fixed Cost			12,50,000
Net Profit			19,10,000

Decision:

However AXE Ltd. can save fixed cost of ₹ 4,07,000 (₹ 12,50,000 - ₹ 8,43,000) if it keeps its production limited to 1,00,000 units. But in this case AXE Ltd. has to subcontract 20,000 units of B to fulfill maximum market demand. Contribution Lost from subcontracting of 20,000 units is amounting to ₹ 20,000 [20,000 units × (₹ 15 - ₹ 14)]. Hence optimum profit would be ₹ 22,97,000 [₹ 19,10,000 + ₹ 4,07,000 - ₹ 20,000].

Statement Showing Production Vs Sub Contract (units) and

Profit – Best Strategy

Prod	Produced [Units]	Sub-Contract [Units]	Contribution [Production] (₹)	Contribution [Sub-Contract] (₹)	Total Contribution (₹)
A	40,000	---	8,40,000	---	8,40,000
B	30,000	25,000	4,50,000	3,50,000	8,00,000
C	---	36,000	---	7,20,000	7,20,000
D	30,000	---	7,80,000	---	7,80,000
Total Contribution					31,40,000
Less: Fixed Cost					8,43,000
Net Profit					22,97,000

(ii) Break Even Point:

Statement Showing Recovery of Fixed Cost

Particulars	Amount (₹)
Fixed Cost (at Best Strategy)	8,43,000
Less: Recovered from Product 'D' (₹26 × 30,000 units)	7,80,000
Balance	63,000
Less: Recovered from Product 'A' $\left(\frac{₹63,000}{₹21} = 3,000 \text{ units} \right)$	63,000

Minimum number of units to be produced to achieve break-even point:

Product D = 30,000 units

Product A = 3,000 units

Accordingly, earliest BEP at 33,000 units

(iii) Assembly Labour is Not a Limiting Factor & No Requirement to Fulfill Max. Market Demand:

Statement Showing Comparison of Contribution *per unit*

(Make Vs Sub-Contracting)

	Demand (Units)			
	40,000	55,000	36,000	30,000
	A	B	C	D
Contribution (₹/u) [Make]	21	15	18	26
Contribution (₹/u) [Sub-Contract]	15	14	20	24
Best Strategy	Make	Make	Sub Contracting	Make
Ranking for Production	II	III	---	I

Decision:

From the above comparison table it can be seen manufacturing of product A, B and D gives higher contribution per unit as compared to sub-contracting. Therefore, AXE Ltd. should manufacture the entire quantity of product A, B and D and Subcontract the production of product C. However AXE Ltd. can save fixed cost of ₹4,07,000 (₹12,50,000 – ₹8,43,000) by limiting its production level to 1,00,000 units only. In this case AXE Ltd. will make 30,000 units, 40,000 units and 30,000 units of product D, A and B respectively. But in this case AXE Ltd. has to subcontract 25,000 units of B to earn maximum profit.

Statement Showing Production Vs Sub Contract (units) and
Profit – Best Strategy

Prod.	Produced [Units]	Sub-Contract [Units]	Contribution [Production] (₹)	Contribution [Sub-Contract] (₹)	Total Contribution (₹)
A	40,000	---	8,40,000	---	8,40,000
B	30,000	25,000	4,50,000	3,50,000	8,00,000
C	---	36,000	---	7,20,000	7,20,000
D	30,000	---	7,80,000	---	7,80,000
Total Contribution					31,40,000
Less: Fixed Cost					8,43,000
Net Profit					22,97,000

It may not be necessary to prepare 'Statement Showing Production Vs Sub Contract (units) and Profit – Best Strategy' for part (iii), but only relevant figures need to be shown.

Question 65

Buildico, a company that builds houses presents the following facts relating to a certain housing contract that it wishes to undertake:

The CEO's and Marketing Director's food and hotel expenses of ₹ 3,750 were incurred for a meeting with a prospective client.

1,200 kgs of raw material Z will be required for the house. Inventory of Z available is 550 kg. It was purchased at ₹ 580 per kg. It is used by Buildico in other projects. Its current market price is ₹ 650 per kg. Its resale value is ₹ 350 per kg.

The house will require 90 hours of engineer's time. The engineers are paid a fixed monthly salary of ₹ 47,500 per engineer who can work 150 hours a month. Spare time is not available now and an engineer has to be hired for this house for one month. He cannot be used in any other project once he does this contract.

Buildico will use a special earthquake proof foundation material. This was developed by Buildico at a cost of ₹ 30,000 for some other project that had to be abandoned. If it does not use it in this project, it can use it in some other project and charge the client ₹ 50,000 for it.

A list of items is given below. You are required to name the type of cost and state whether it is relevant or not in calculating the cost of the given housing project:

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S. No.	Item	Type of Cost	Relevant (R)/ Irrelevant (IR)
1	Food and hotel expenses ₹ 3,750		
2. (i)	Material Z : 550 kg × ₹ 580/kg		
(ii)	Material Z : 550 kg × ₹ 650 per kg		
3. (i)	Engineer's salary ₹ 47,500		
(ii)	Engineer's free time cost $\frac{60}{150} \times ₹ 47,500$		
4. (i)	Design cost ₹ 30,000		
(ii)	Design cost ₹ 50,000		

(8 Marks) (May, 2014)

Answer

Sl. No.	Item	Type of Cost	Relevant (R) / Irrelevant (IR)
1	Food and hotel expenses ₹3,750	Sunk Cost	Irrelevant
2(i)	Material Z: 550 kg × ₹580/kg	Historical Cost / Sunk Cost	Irrelevant
(ii)	Material Z: 550 kg × ₹650 per kg	Replacement Cost	Relevant
3(i)	Engineer's salary ₹47,500	Period Cost	Relevant
(ii)	Engineer's free time cost $\frac{60}{150} \times ₹47,500$	Committed Cost / Unavoidable Cost	Irrelevant
4(i)	Design cost ₹30,000	Sunk Cost	Irrelevant
(ii)	Design cost ₹50,000	Opportunity Cost	Relevant

Question 66

On the basis of the following information determine the product-mix to give the highest profit if atleast two products are produced:

Product	X	Y	Z
Raw material per unit (kg)	20	12	30
Machine hours per unit (hours)	3	5	4
Selling price per unit (₹)	500	400	800
Maximum limit of production Unit	1,500	1,500	750

Only 9,200 hours are available for production at a cost of ₹20 per hour and maximum 50,000 kgs. of material @ ₹ 20 per kg., can be obtained.

(Only product mix quantities are to be shown, calculation of total profit at that product mix not required to be shown) (8 Marks) (November, 2014)

Answer

Computation of Contribution per Key Factor(s) for Various Products

Particulars	Products		
	X	Y	Z
Selling Price p. u. (₹)	500	400	800
Variable Cost p. u. (₹):			
Material	400 (₹20 × 20 Kg.)	240 (₹20 × 12 Kg.)	600 (₹20 × 30 Kg.)
Machine Charge	60 (₹20 × 3 hrs)	100 (₹ 20 × 5 hrs)	80 (₹20 × 4 hrs)
Total Variable Cost p. u. (₹)	460	340	680
Contribution p. u. (₹)	40	60	120
Ranking	III	II	I
Requirement of Material (Kg.)	20	12	30
Contribution per Kg.(₹)	2.00	5.00	4.00
Ranking	III	I	II
Requirement of Machine Hours (Hrs.)	3	5	4
Contribution per hour(₹)	13.33	12.00	30.00
Ranking	II	III	I

It is clear from the above ranking(s):-

- I. Contribution per Unit is maximum in case of product Y & Z.
- II. Contribution per Kg. of Raw Material also maximum in case of product Y & Z.
- III. Contribution per Machine Hour is maximum in case of product X & Z.

So product Z is common in all cases and priority shall be given for production of 'Z'. Balance resources should be divided between other two products X & Y.

Statement Showing Balance Resources for Product X & Y

Resources	Maximum Availability (a)	Maximum Production Z (b)	Consumption of Resources p.u. (c)	Total Cons. (d) = (b) x (c)	Balance (a) - (d)
Material	50,000 Kg.	750	30 Kg.	22,500 Kg.	27,500 Kg.
Machine Hrs.	9,200 Hrs.	750	4 Hrs.	3,000 Hrs.	6,200 Hrs.

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The production of X & Y may be calculated with the help of following equations by utilizing balance resources: -

$$20X + 12Y = 27,500 \dots(i)$$

$$3X + 5Y = 6,200 \dots(ii)$$

Then,

$$30X + 18Y = 41,250$$

...equation (i) multiplied by 1.5

$$30X + 50Y = 62,000$$

...equation (ii) multiplied by 10

$$\begin{array}{r} - \\ - \\ - \\ \hline -32Y = -20,750 \end{array}$$

$$Y = 648.43 \text{ i.e. } 648 \text{ units}$$

Putting the value of Y in equation (ii)

$$3X + (5 \times 648) = 6,200$$

Or $3X = 2,960$

Or $X = 986 \text{ units}$

So the of Product Mix is

$$X = 986 \text{ units}$$

$$Y = 648 \text{ units}$$

$$Z = 750 \text{ units}$$

Question 67

A manufacturing company has three factories namely 'Factory A', 'Factory B' and 'Factory C'. All three factories produce the same product which are sold at ₹ 750 per unit. The factory-wise estimates of operation results for 2014 are as follows:

(₹ inlaks)

	Factory A	Factory B	Factory C	Total
Sales	600	2,400	1,200	4,200
Costs:				
Raw materials	150	700	290	1,140
Direct labour	150	560	280	990
Factory overheads-variable	40	220	110	370

Factory overheads-fixed	80	240	120	440
Selling overheads-variable	46	140	80	266
Selling overheads-fixed	30	100	60	190
Administrative overheads	40	180	80	300
Head office expenses	24	100	60	184
Profit	40	160	120	320

When the above estimates were under finalization, the company's legal department advised that the lease of Factory 'A' was due to expire on 31st December, 2013 and that it could be renewed by enhancing the lease rent by ₹ 24 lakhs per annum. Since this enhancement will have impact on the profitability of the company, the management is constrained to examine following proposals:

- Renew the lease and bear the impact.
- Close down factory 'A', sell off plant, machinery and stock and liquidate all liabilities including the staff and workers', pay retrenchment compensation from sale proceeds which are sufficient for the purpose.

In order however to maintain the customer relations, the total planned output of the factory 'A' will be transferred to EITHER factory 'B' OR factory 'C'. Plant capacity is available at both the factories to takeover the manufacture. The additional cost involved in the manufacture of the extra output so transferred in factory 'B' and 'C' are estimated as under:

		Factory B	Factory C
(a)	Additional fixed overheads due to increase in capacity utilization (per annum)	₹100 lakhs	₹80 lakhs
(b)	Additional freight, selling and other overheads to produce and distribute the output to the present customers of factory 'A'	₹50 per unit	₹70 per unit

You are required to prepare comparative statements of profitability in the aforesaid alternative courses of action and give your recommendations. (9 Marks) (November, 2014)

Answer

- Impact on Profit of Continuance of Production by Renewing the Lease

(₹ in lakhs)

	Factories			
	A	B	C	Total
Sales ... (A)	600	2,400	1,200	4,200
Less: Variable Cost				

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Raw Material	150	700	290	1,140
Direct Labour	150	560	280	990
Factory Overheads (Variable)	40	220	110	370
Selling Overheads (Variable)	46	140	80	266
Total Variable Costs ... (B)	386	1,620	760	2,766
Contribution ... (C) = (A) – (B)	214	780	440	1,434
Less: Fixed Cost				
Factory Overheads (Fixed)	80	240	120	440
Selling Overheads (Fixed)	30	100	60	190
Administration Overheads	40	180	80	300
Head Office Expenses	24	100	60	184
Additional Lease Rent	24	--	--	24
Total Fixed Costs (D)	198	620	320	1,138
Profit (C)–(D)	16	160	120	296

The above statement shows that though profit is reduced from existing ₹320 lakhs to ₹296 lakhs, still factory 'A' generates a contribution towards head office expenses.

(ii) Comparative Statements of Profitability (₹in lakhs)

	When Production of Factory A is Transferred to Factory B			When Production of Factory A is Transferred to Factory C		
	B	C	Total	B	C	Total
Sales	3,000	1,200	4,200	2,400	1,800	4,200
Less: Variable Costs	2,065	760	2,825	1,620	1,196	2,816
Contribution	935	440	1,375	780	604	1,384
Less: Fixed Costs	720	320	1,040	620	400	1,020
Profit	215	120	335	160	204	364

Since transfer of production of factory 'A' to factory 'C' yields higher profit, i.e., ₹364 lakhs, this course is recommended.

Workings

Variable and Fixed Costs When the Production of Factory 'A' is Transferred to Factory 'B':-

(₹in lakhs)

	Sales	Variable Costs	Fixed Costs
'B'	2,400	1,620	620
'A'	600	405 $\left(\frac{₹1,620}{2,400} \times 600 \right)$	---
Additional Costs	---	40.00 (80,000* × ₹50)	100
Total	3,000	2,065	720

(*) 80,000 units (₹600 lakhs ÷ ₹750)

Variable and Fixed Costs when the Production of Factory 'A' is transferred to Factory 'C'-

(₹in lakhs)

	Sales	Variable Costs	Fixed Costs
'C'	1,200	760	320
'A'	600	380 $\left(\frac{₹760}{1,200} \times 600 \right)$	---
Additional Costs	---	56 (80,000 × ₹70)	80
Total	1,800	1,196	400



This solution may also be done with the assumption that head office expenses attributable to factory A will be charged to the factory to which its production has been transferred.

Question 68

Explain the concept of relevancy of cost by citing three examples each of relevant costs and non-relevant costs. (4 Marks) (November, 2014)

Answer

Relevant costs are those costs which are pertinent to a decision. In other words, these are the costs which are influenced by a decision. Those costs which are not affected by the decision are not relevant costs.

Examples of Relevant Costs are-

- (1) All variable costs are relevant costs.
- (2) Fixed Costs which vary with the decision are relevant costs.
- (3) Incremental costs are relevant costs.

Examples of Non-Relevant Costs are-

- (1) All fixed costs are generally non-relevant.
- (2) Variable costs which do not vary with the decision are not relevant costs.
- (3) Book value of the asset is not relevant.