

PAPER – 5 : COST MANAGEMENT

Question No. 1 is compulsory. Answer any four from the rest.

Working notes should form part of the answer.

Question 1

- (a) The following table gives the activities in a construction project and the time duration of each activity:

Activity	Preceding activity	Normal Time (Days)
A	—	16
B	—	20
C	A	8
D	A	10
E	B, C	6
F	D, E	12

Required:

- (i) Draw the activity network of the project.
 - (ii) Find critical path.
 - (iii) Find the total float and free-float for each activity.
- (b) A manufacturer produces three products whose cost data are as follows:

	X	Y	Z
Direct materials (Rs. / Unit)	32.00	76.00	58.50
Direct Labour:			
Deptt.	Rate / hour (Rs.)	Hours	Hours
1	2.50	18	20
2	3.00	5	7
3	2.00	10	20
Variable overheads (Rs.)	8	4.50	10.50

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

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

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

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

Required:

- (i) Prepare a statement of budgeted profitability.
 - (ii) Set optimal product mix and calculate the optimal profit.
- (c) S Limited is engaged in manufacturing activities. It has received a request from one of its important customers to supply a product which will require conversion of material 'M', which is a non-moving item.

The following details are available:

Book value of material M	Rs. 60
Realisable value of material M	Rs. 80
Replacement cost of material M	Rs. 100

It is estimated that conversion of one unit of 'M' into one unit of the finished product will require one labour hour. At present, labour is paid at the rate of Rs. 20 per hour. Other costs are as follows:

Out-of-pocket expenses	Rs. 30 per unit
Allocated overheads	Rs. 10 per unit

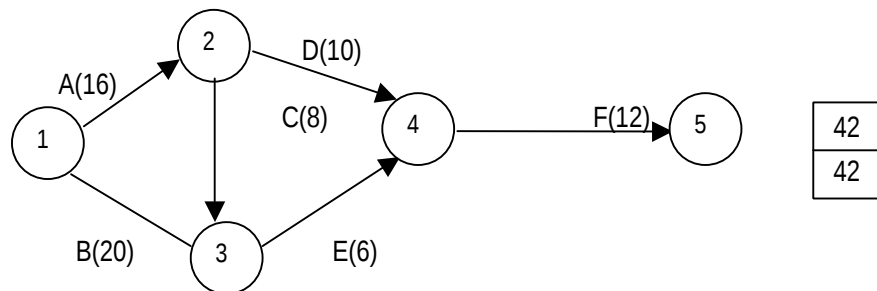
The labour will be re-deployed from other activities. It is estimated that the temporary redeployment will not result in loss of contribution. The employees to be re-deployed are permanent employees of the company.

Required:

Estimate the minimum price to be charged from the customer so that the company is not worse off by executing the order. (6 + 14 + 4 = 24 Marks)

Answer

(a) (i)



A → D → F = 16 + 10 + 12 = 38

B → E → F = 20 + 6 + 12 = 38

(ii) A – C – E – F = 16 + 8 + 6 + 12 = 42 Critical path

(iii) Total float and free float for each activity

Activity	Normal time (Days)	Earliest start	Time finish	Latest start	Time finish	Float total	Free
A	16	0	16	0	16	0	0
B	20	0	20	4	24	4	4
C	8	16	24	16	24	0	0
D	10	16	26	20	30	4	4
E	6	24	30	24	30	0	0
F	12	30	42	30	42	0	0

(b) 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 (Rs.)	15.00	12.50	20.00
Total contribution (Rs.)	2,92,500	1,95,000	3,12,000

Contribution fund (Rs.)	7,99,500
Fixed overheads (Rs.)	<u>4,00,000</u>
Profit (Rs.)	<u>3,99,500</u>

(ii) Contribution per direct labour hour for Department 2

	X	Y	Z
Contribution per unit (Rs.)	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

Optimal profit (Rs.)

Contribution (Rs.)

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

- (c) Relevant costs of producing one unit of the finished product

	Rs.
Cost of material 'M' (realisable value)	80
Cost of labour (Being sunk cost)	0
Out-of-pocket expenses	<u>30</u>
	<u>110</u>

Allocated overhead is not relevant for the decision. The customer should be charged Rs. 110 per unit.

Question 2

- (a) 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 Rs. 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 Rs. 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 Rs. 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 Rs. 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:

- Advise whether inspection at the point of receipt is justified?
- Which of the two suppliers should be asked to supply?

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

- (b) What are the distinctive features of learning curve theory in manufacturing environment? Explain the learning curve ratio. (10 + 9 = 19 Marks)

Answer

- (a) 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	Rs.	Rs.
Purchase price (Rs.)	18,000	17,400
Production damage (Rs.)	<u>540</u>	<u>900</u>
Total Cost (Rs.)	<u>18,540</u>	<u>18,300</u>
Good component (units)	9,700	9,500
Cost per 100 good component (Rs.)	<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	Rs.	Rs.
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 (Rs.)	<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.
- (b) As the production quantity of a given item is doubled, the cost of the item decreases at a fixed rate. This phenomenon is the basic premise on which the theory of learning curve has been formulated. As the quantity produced doubles, the absolute amount of cost increase will be successively smaller but the rate of decrease will remain fixed. It occurs due to the following distinctive features of manufacturing environment:
- (i) Better tooling methods are developed and used.
 - (ii) More productive equipments are designed and used to make the product.
 - (iii) Design bugs are detected and corrected.
 - (iv) Engineering changes decrease over time.
 - (v) Earlier teething problems are overcome.

(vi) Rejections and rework tend to diminish over time.

In the initial stage of a new product or a new process, the learning effect pattern is so regular that the rate of decline established at the outset can be used to predict labour cost well in advance. The effect of experience on cost is summarized in the learning curve ratio or improvement ratio.

$$\text{Learning curve ratio} = \frac{\text{Average labour cost of first } 2N \text{ units}}{\text{Average labour cost of first } N \text{ units}}$$

For example, if the average labour cost for the first 500 units is Rs. 25 and the average labour cost for the first 1,000 units is Rs. 20, the learning curve ratio is (Rs. 20/25) or 80%. Since the average cost per unit of 1,000 units is Rs. 20, the average cost per unit of first 2,000 units is likely to be 80% of Rs. 20 or Rs. 16.

Question 3

The working results of a Software Company for two corresponding years are shown below:

	Amount (Rs. in lakhs)	
	Year 2005	Year 2006
Sales (A)	600	770
Cost of Sales:		
Direct materials	300	324
Direct wages and variable overheads	180	206
Fixed overheads	<u>80</u>	<u>150</u>
Total (B)	<u>560</u>	<u>680</u>
Profit (A – B)	<u>40</u>	<u>90</u>

In year 2006, there has been an increase in the selling price by 10 per cent. Following are the details of material consumption and utilization of direct labour hours during the two years:

	Year 2005	Year 2006
Direct material consumption (M. tons)	5,00,000	5,40,000
Direct labour hours	75,00,000	80,00,000

Required:

- Taking year 2005 as base year, analyse the variances of year 2006 and also work out the amount which each variance has contributed to change in profit.
- Find out the breakeven sales for both years.
- Calculate the percentage increase in selling price in the year 2006 that would be needed over the sale value of year 2006 to earn margin of safety of 45 per cent. (19 Marks)

Working Notes:

- (i) Budgeted sales in year 2006 = $(100/110) \times 770 = \text{Rs. } 700 \text{ lakhs}$
- (ii) Budgeted direct material cost = $(300/600) \times 700 = \text{Rs. } 350 \text{ lakhs}$
- (iii) Budgeted direct wages and variable overheads = $(180/600) \times 700 = \text{Rs. } 210 \text{ lakhs}$
- (iv) Rate per M. ton of direct material: Year 2005 = $(300/5) = \text{Rs. } 60$
: Year 2006 = $(324/5.40) = \text{Rs. } 60$
- (v) Material usage budget for the year 2006 = $(5/600) \times 700 = 5.83333 \text{ lakhs}$
- (vi) Direct labour hours budget for the year 2006 = $(75/600) \times 700 = 87.50 \text{ lakhs}$
- (vii) Direct labour and variable overheads rate per hour: Year 2005 = $(180/75) = \text{Rs. } 2.40$
Year 2006 = $(206/80) = \text{Rs. } 2.575$
- (viii) Material price variance = $(\text{Rs. } 60 - \text{Rs. } 60) \times 5,40,000 = \text{zero}$
- (ix) Material usage variance = $(5.83333 - 5.40) \times \text{Rs. } 60 = \text{Rs. } 26 \text{ lakhs (F)}$
- (x) Labour and variable overheads rate variance = $(2.40 - 2.575) \times 80 = \text{Rs. } 14 \text{ lakhs (A)}$
- (xi) Labour and variable overheads efficiency variance = $(87.50 - 80.00) \times \text{Rs. } 2.40$
= $\text{Rs. } 18 \text{ lakhs (F)}$
- (xii) Fixed overheads expenditure variance = $(150 - 80) = \text{Rs. } 70 \text{ lakhs (A)}$
- (xiii) Statement of working results of the company

	Actuals	Budget	Variance
	2006	2006	
Sales	<u>770</u>	<u>700</u>	<u>70(F)</u>
Less: Direct material	324	350	26(F)
Direct wages and variable overheads	<u>206</u>	<u>210</u>	<u>4(F)</u>
Contribution	240	140	100(F)
Less: Fixed overheads	<u>150</u>	<u>80</u>	<u>70(A)</u>
Profit	90	60	30(F)

I Reconciliation statement showing variances contribution to change in profit (Rs. in lakhs)

	Favourable	Adverse
Increase in contribution due to volume	20	—
Sales price variance	70	—
Material usage variance	26	—
Material price variance	—	—
Direct labour and variable overheads rate variance	—	14
Direct labour and variable overheads efficiency variance	18	—
Fixed overheads expenditure variance	<u>—</u>	<u>70</u>
	<u>134</u>	<u>84</u>
Total change in profit (increase)	<u>50</u>	

II Break-even point

Year 2005 : $(80/120) \times 600 = \text{Rs. } 400 \text{ lakhs}$

Year 2006 : $(150/240) \times 770 = \text{Rs. } 481.25 \text{ lakhs}$

III Required percentage increase in selling price in the year 2006 to earn a margin of safety of 45%.

Break-even sales = $(1 - 0.45)$ or 55 per cent of total sales.

Contribution at 55% sales = Fixed overheads = Rs. 150 lakhs.

Required contribution at total sales = $\text{Rs. } 150 / 0.55 = \text{Rs. } 272.73 \text{ lakhs}$

Additional contribution required = $(272.73 - 240) = \text{Rs. } 32.73 \text{ lakhs}$

Percentage increase in selling price required = $(32.73/770) \times 100 = 4.25\%$.

Question 4

- (a) A company has four zones open and four marketing managers available for assignment. The zones are not equal in sales potentials. It is estimated that a typical marketing manager operating in each zone would bring in the following Annual sales:

Zones	Rs.
East	2,40,000
West	1,92,000
North	1,44,000
South	1,20,000

The four marketing managers are also different in ability. It is estimated that working under the same conditions, their yearly sales would be proportionately as under:

Manager M	:	8
Manager N	:	7
Manager O	:	5
Manager P	:	4

Required:

If the criterion is maximum expected total sales, find the optimum assignment and the maximum sales.

- (b) "In many organisations, initiatives to introduce balanced score card failed because efforts were made to negotiate targets rather than to build consensus."

Required:

Elucidate the above statement.

(11 + 8 = 19 Marks)

Answer

- (a) Sum of the proportion = $(8 + 7 + 5 + 4) = 24$

Assuming Rs. 1,000 as one unit, the effective matrix is as follows:

Effective Matrix

Managers	Zones			
	East	West	North	South
M	$(8/24) \times 240 = 80$	$(8/24) \times 192 = 64$	$(8/24) \times 144 = 48$	$(8/24) \times 120 = 40$
N	$(7/24) \times 240 = 70$	$(7/24) \times 192 = 56$	$(7/24) \times 144 = 42$	$(7/24) \times 120 = 35$
O	$(5/24) \times 240 = 50$	$(5/24) \times 192 = 40$	$(5/24) \times 144 = 30$	$(5/24) \times 120 = 25$
P	$(4/24) \times 240 = 40$	$(4/24) \times 192 = 32$	$(4/24) \times 144 = 24$	$(4/24) \times 120 = 20$

Convert the maximization problem to minimization problem

The resultant loss matrix is as follows:

Loss Matrix

Managers	East	West	North	South
M	0	16	32	40
N	10	24	38	45
O	30	40	50	55
P	40	48	56	60

Row operation

Managers	East	West	North	South
M	0	16	32	40
N	0	14	28	35
O	0	10	20	25
P	0	8	16	20

Column operation

Managers	East	West	North	South
M	0	8	16	20
N	0	6	12	15
O	0	2	4	5
P	0	0	0	0

Managers	East	West	North	South
M	0	6	14	18
N	0	4	10	13
O	0	0	2	3
P	2	0	0	0

Managers	East	West	North	South
M	0	2	10	14
N	0	0	6	9
O	4	0	2	3
P	6	0	0	0

Managers	East	West	North	South
M	0	2	8	12
N	0	0	4	7
O	4	0	0	1
P	8	2	0	0

Assignment	Sales
	Rs.
M – East	80,000
N – West	56,000
O – North	30,000
P – South	<u>20,000</u>
	<u>1,86,000</u>

- (b) Balanced score card is a set of financial and non-financial measures relating to a company's critical success factors. It is an approach which provides information to management to assist in strategy implementation. Therefore, the components to be included in the balanced score card must flow from strategy. The targets should be measurable and must flow from strategy and corporate plan of the company. It is necessary that managers should agree to the components and targets because in absence of a consensus, managers may not commit to the targets established by the top management / the board of directors. Moreover, the functions are interdependent and results in one functional area/perspective (e.g. innovation and learning) have direct bearing on the results in other functional area / perspective (e.g. customer perspective). Therefore, it is not sufficient that individual managers agree to their targets. Successful implementation requires that the top management builds an overall consensus on the components and targets of the balanced score card. Negotiation undermines the fundamental principle that the components and targets should flow from strategy. As a result, an approach to establish targets through negotiation defeats the very purpose of balanced score card.

Question 5

- (a) "Cost can be managed only at the point of commitment and not at the point of incidence. Therefore, it is necessary to manage cost drivers to manage cost." Explain the statement with reference to structural and executional cost drivers.
- (b) Explain the main features on 'Enterprise Resource Planning.'
- (c) X Limited having an installed capacity of one lakh units of a product is currently operating at 70 per cent utilization. At current level of input prices, the F.O.B. costs per unit, taking credit for applicable export incentive workout as follows:

Capacity Utilisation	70%	80%	90%	100%
FOB cost per unit (Rs.)	97	92	87	82

The company has received three Foreign offers as under:

Source A : 5,000 units @ Rs. 55 per unit FOB

Source B : 10,000 units @ Rs. 52 per unit FOB

Source C : 10,000 units @ Rs. 51 per unit FOB

Required:

Advice the company whether it should accept any or all of the export orders.

(5 + 4 + 10 = 19 Marks)

Answer

- (a) A firm commits costs at the time of designing the product and deciding the method of production. It also commits cost at the time of deciding the delivery channel (e.g. delivery through dealers or own retail stores). Costs are incurred at the time of actual production and delivery. Therefore, no significant cost reduction can be achieved at the time when the costs are incurred. Therefore, it is said that costs can be managed at the point of commitment. Cost drivers are factors that drive consumption of resources. Therefore, management of cost drivers is essential to manage costs. Structural cost drivers are those which can be managed by effecting structural changes. Examples of structural cost drivers are scale of operation, scope of operation (i.e. degree of vertical integration), complexity, technology and experience or learning. Thus, structural cost drivers arise from the business model adopted by the company. Executional cost drivers can be managed by executive decisions, examples of executional cost drivers are capacity utilization, plant layout efficiency, product configuration and linkages with suppliers and customers. It is obvious that cost drivers can be managed only at the point of structural and operating decisions, which commit resources to various activities.
- (b) Some of the major features of "Enterprise Resource Planning" (ERP) areas follows :
- (i) ERP facilitates company-wide integrated information system covering all functional areas like manufacturing, selling and distribution, payables, receivables, inventory etc.
 - (ii) It performs core activities and increases customer services thereby augmenting the corporate image.
 - (iii) ERP bridges the information gap across organization.
 - (iv) ERP provides complete integration of systems.
 - (v) It is a solution for better project management.
 - (vi) It allows automatic induction of latest technologies like electronic fund transfer (EFT), Electronic Data Interchange (EDI), Internet, Intranet, Video Conferencing, E-commerce etc.
 - (vii) ERP eliminates most business problems like material shortage, productivity enhancements, customer service, cash management etc.
 - (viii) It provides business intelligence tools.

(c)

Statement of differential cost

Capacity	Output(Units)	FOB cost per unit (Rs.)	Total cost (Rs.)	Differential Cost (Rs.)	Differential Cost per unit (Rs.)
70%	70,000	97	67,90,000	—	—
80%	80,000	92	73,60,000	5,70,000	57
90%	90,000	87	78,30,000	4,70,000	47
100%	1,00,000	82	82,00,000	3,70,000	37

Statement showing gain or loss for various export orders

Source	Quantity (Units)	Differential Cost per unit (Rs.)	Differential Cost Total (Rs.)	Sales Revenue (Rs.)	Profit / Loss (Rs.)
A	5,000	57	2,85,000	2,75,000	–10,000
B	10,000	57 for 5,000 47 for 5,000	5,20,000	5,20,000	—
C	10,000	47 for 5,000 37 for 5,000	4,20,000	5,10,000	+90,000
Total	<u>25,000</u>		<u>12,50,000</u>	<u>13,05,000</u>	<u>+80,000</u>

If proposal A is accepted the company will suffer a loss of Rs. 10,000 with an idle capacity of 5,000 units.

If proposals A and B are accepted, the company will suffer a loss of Rs. 10,000 with an idle capacity of Rs. 5,000 units.

If the company accepts all the three proposals, it will earn profit of Rs. 80,000 with an idle capacity of 5,000 units.

Therefore, the company should accept all three proposals.

Question 6

- (a) What is the fundamental difference between Activity Based Costing System (ABC) and Traditional Costing System? Why more and more organisations in both the manufacturing and non-manufacturing industries are adopting ABC?
- (b) What is Target Costing? It is said that implementation of the target costing technique requires intensive marketing research. Explain why intensive marketing research is required to implement target costing technique. (10 + 9 = 19 Marks)

Answer

- (a) In the traditional system of assigning manufacturing overheads, overheads are first allocated and apportioned to cost centres (production and support service cost centres) and then absorbed to cost objects (e.g. products). Under ABC, overheads are first assigned to activities or activity pools (group of activities) and then they are assigned to cost objects. Thus, ABC is a refinement over the traditional costing system. Usually cost centres include a series of different activities. If different products create different demands on those activities, the traditional costing system fails to determine the product cost accurately. In that situation, it becomes necessary to use different rates for different activities or activity pools.

The following are the reasons for adoption of ABC by manufacturing and non-manufacturing industries:

- (i) Fierce competitive pressure has resulted in shrinking profit margin. ABC helps to estimate cost of individual product or service more accurately. This helps to formulate appropriate marketing / corporate strategy.
 - (ii) There is product and customer proliferation. Demand on resources by products / customers differ among product / customers. Therefore, product / customer profitability can be measured reasonably accurately, only if consumption of resources can be traced to each individual product / customer.
 - (iii) New production techniques have resulted in the increase of the proportion of support service costs in the total cost of delivering value to customers. ABC improves the accuracy of accounting for support service costs.
 - (iv) The costs associated with bad decisions have increased substantially.
 - (v) Reduction in the cost of data processing has reduced the cost of tracking resources consumption to large number of activities.
- (b) Target cost is the difference between estimated selling price of a proposed product with specified functionality and quality and the target margin. This is a cost management technique that aims to produce and sell products that will ensure the target margin. It is an integral part of the product design. While designing the product, the company needs to understand what value target customers will assign to different attributes and different aspects of quality. This requires use of techniques like value engineering and value analysis. Intensive marketing research is required to understand customer preferences and the value they assign to each attribute and quality parameter. This insight is required to be developed must before the product is introduced. The company plays within the space between the maximum attributes and quality that the company can offer and the minimum acceptable to target customers. Therefore in absence of intensive marketing research, the target costing technique cannot be used effectively.