Paper 15 – Strategic Cost Management and Decision Making

Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours **Full Marks: 100**

Section A

1. Answer the following and each question carries 2 marks. [10×2= 20]

(i) A Ltd., developing a new product, makes a model for testing and goes for regular production. From past experience of similar models, it is known that a 90% learning curve applies. If the time taken to make the model is 300 hours, what will be the total time taken to produce 3rd to 4th unit of the product?
(a) 540 hours (b) 486 hours (c) 432 hours (d) None of the above

(ii) ABC Ltd., has current PBIT of ₹19.20 Lakhs on total assets of ₹96 Lakhs. The company proposes to increase assets by ₹24 Lakhs, which is estimated to increase operating profit before depreciation by ₹8.40lakhs-a net increase in Depreciation by ₹4.80 Lakhs. This will result in ROI.
(a) To decrease by 1 % **(b) To increase by 1%**
(c) To remain same **(d) None of the above**

(iii) The selling price of the single product manufactured by a company is fixed at ₹1500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:
(a) ₹9.30 (b) ₹9.50 (c) ₹1050 (d) None of these

(iv) A particular job required 800 kgs of material – P.
500 kgs. of the particular material is currently in stock.
The original price of the material – P was ₹300 but current resale value of the same has been determined as ₹200. If the current replacement price of the material – P is ₹0.80 per kg., the relevant cost of the material – P required for the job would be:
(a) ₹640 (b) ₹440 (c) ₹300 (d) None of these

(v) A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
(a) 30.6% (b) 44% (c) 86.4% (d) None of these

(vi) A company has 2000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
(a) ₹ 8,000 (b) ₹ 12,000 (c) ₹ 3,000 (d) ₹ 10,000

(vii) A company has estimated the selling prices and the variable costs of one of its products as under :

Probability	Selling price (per unit)	Probability	Variable cost (per unit)
0.25	60	0.25	30
0.45	75	0.40	45
0.30	90	0.35	60

The company will be able to produce and sell 4,000 units in a month irrespective of the selling price. The selling price and variable cost per unit are independent of each other. The specific fixed cost relating to this product is ₹20,000. The probability that the monthly net profit of the product will be $\geq$ ₹1,20,000 is
(a) 0.2525 (b) 0.4512 (c) 0.3825 (d) 0.3075

(viii) When allocation service department cost to production departments, the method that does not consider different cost behavior patterns is the
(a) Step method (b) Reciprocal method
(c) Single rate-method (d) Dual rate-method

(ix) ASHLIN LTD., has developed a new product just complete the manufacture of first four units of the product. The fist unit took 2 hours to manufacture and the first four units together took 5.12 hours to produce. The Learning Curve rate is
(a) 83.50% (b) 80.00% (c) 75.50% (d) None of (a), (b) or (c)

(x) ANKIT LTD., operates Throughput Accounting System. The details of product A per unit are as under:

Selling Price	**₹75**
Material Cost	**₹30**
Conversion Cost	**₹20**
Time to bottleneck resources	**10 minutes**

The return per hour for product A is
(a) ₹270 (b) ₹150 (c) ₹120 (d) ₹90

Answer:

1. (i) (c) 432 hours

Cumulative output	Average time/unit (hrs.)	Total time (hrs.)	Incremental Time (hrs.)
1	300	300	
2	270 (0.9 × 300)	540	
3	243 (0.9 × 270)	972	432 (972 – 540)

(ii) (a) To decrease by 1%

ROI (₹ Lakhs)

Without Investment		With Investment	
PBIT	19.20	(+8.40 – 4.80)	22.80
Total Assets	96.00		120.00
ROI (%)	20.00		19.00

Hence, ROI decreases by 1%.

(iii) (c) ₹ 1,050

Particulars	₹
Sales Revenue = 500 × ₹ 1,500	7,50,000
Less: ROI 15% on ₹ 15 Lakhs =	2,25,000
Target Cost	5,25,000

Target Cost per unit = Target cost / 500 = 5,25,000 / 500 = ₹ 1,050.

(iv) (b) ₹ 440

Particulars	₹
500 kgs. of material in stock at resale value	200
Balance 300 kgs. of material at current price of ₹ 0.80	240
Relevant Cost of the material	440

(v) (a) 30.6%

When V (Var. Cost) = 100, SP = 160, M. Cost / SP = 60/100
SP after 10% mark down of SP = 144, Cost = 60 – 16 = 44
Contribution Margin Ratio = 44 / 144 = 0.3056 = 30.6%

(vi) (c) ₹ 8,000

Original price is not relevant

Rework income	₹ 18,000	
Deduct cost of rework	10,000	
New inflow	₹ 8,000	It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹ 3,000. Hence, the opportunity cost is ₹ 3,000.

(vii) (d) 0.3075

The sales demand is 4,000 units per month. The monthly contribution must absorb the fixed costs of ₹ 20,000 and leave at least a surplus of ₹ 1,20,000 profit. So the contribution per unit must be ₹ 1,40,000/4,000 units = ₹ 35 in the minimum.
The following selling price and variable cost pairs will produce a contribution of more than ₹ 35.

Selling Price (₹)	Variable Cost (₹)	Contribution (₹)	Joint Probability of SP & VC
75	30	45	0.45 × 0.25 = 0.1125
90	30	60	0.30 × 0.25 = 0.0750
90	45	45	0.30 × 0.40 = 0.1200
			0.3075

(viii) (c) The single rate method

The single rate method combines fixed and variable costs without regard to cost behavior patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rare; and answer D allows variable costs to be allocated on different basis from fixed costs.

(ix) (b) 80%

Let the learning rate be x.
Since the first unit took 2 hours, average time for the first two units = 2x and
The average time for the first 4 units = $2x \times x = 2x^2$.

$\therefore 2x^2 = 5.12 \div 4 = 1.28.$

Or, $x = \sqrt{1.28 \div 2}$
$= \sqrt{0.64}$
= 0.80 i.e. 80%.

(x) (a) ₹ 270

(Selling Price – Material Cost) / Time on bottleneck resources.
= [(₹ 75 – ₹ 30)/ 10 minutes] × 60
= ₹ 270

Section B

Answer any five questions from Question No. 2 to 8
Each question carries 16 marks. 5 × 16 = 80 M

2. (a) K & Co. manufactures and sells 15,000 units of a product. The Full Cost per unit is ₹200. The Company has fixed its price so as to earn a 20% Return on an Investment of ₹18,00,000.

Required:

1. **Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.**
2. **If the Selling Price as calculated above represents a Mark-up % of 40% on Variable cost per unit, calculate the Variable cost per unit.**
3. **Calculate the Company's Income if it had increased the Selling Price to ₹230. At this price, the company would have sold 13,500 units. Should the Company have increased the Selling price to ₹230?**
4. **In response to competitive pressures, the Company must reduce the price to ₹210 next year, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year? [8]**

(b) M Ltd. has been approached by a customer who would like a special job to be done for him and is willing to pay ₹22,000 for it. The job would required the following materials.

Materials	Total units required	Units already in stock	Book value of units in stock (₹/unit)	Realisable value (₹/unit)	Replacement cost (₹/unit)
A	1,000	0	-	-	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

(I) Material B is used regularly by X Ltd., and if stocks were required for this job, they would need to be replaced to meet other production demand.

(ii) Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material, which currently cost ₹5 per unit (of which the company has no units in stock at the moment). What are the relevant costs of material, in deciding whether or not to accept the contract? Assume all other expenses on this contract are to be specially uncured besides the relevant cost of material is ₹550.

Answer:

2. (a)

1. Target Sale Price per unit = Full Cost + Target Profit = ₹200 + $\frac{₹18,00,000 \times 20\%}{15,000 \text{ units}}$	₹224
So, Mark-up on Full Cost = ₹24 ÷ ₹200	12%
2. Above Sale Price ₹224 = VC + 40% thereon, i.e. 140% on VC. So, Var. Cost = $\frac{₹224}{140\%}$	₹160
3. Present Contribution at 15,000 units = (₹224 – ₹160) x 15,000 units =	₹9,60,000
Revised Contribution at 13,500 units = (₹230 – ₹160) x 13,500 units =	₹9,45,000
Hence, Increase in Sale Price is not beneficial, due to reduction in	₹15,000

contribution by	
4. Target Profit for next year = $\frac{₹16,50,000 \times 20\%}{15,000 \text{ units}} = ₹22$ So, Target Cost for next year = New Sale Price less Target Profit = ₹210 – ₹22	₹188
Since Revised Contribution is less than Target Contribution above, rent reduction is not advisable.	

(b) Computation of relevant cost of the job:

A	(1000 x 6)	6000.00
B	(1000 x 5)	5000.00
C	[(700 x 2.5) + (300 x 4)]	2950.00
D	(300 x 5)	1500.00
		15,450.00
Add: Other expenses		550.00
		16,000.00

Conclusion: As the revenue from the order, which is more than the relevant cost of ₹16,000, the order should be accepted.

3. (a) S. H. Ltd., a cycle manufacturing company, has drawn up a programme for the manufacture of a new product for the purpose of fuller utilization of its capacity. The scheme envisages the manufacture of baby tricycle fitted with a bell. The company estimates the sales of tricycles at 10,000 during the first year and expects that from the second year onwards the sales estimates will stabilize at 20,000 tricycles. Since the company has no provision for the manufacture of the small bells specially required for the tricycles, the requirement of the bells is initially proposed to be met by way of purchase from the market at ₹8 each. However, if the company desires to manufacture the bell in its factory by installation of new equipment, it has two alternative proposals as under:

	Installation of Super X Machine	Installation of Janta Machine
Initial cost of machine	**₹3,00,000**	**₹2,00,000**
Life	**10 Years**	**10 Years**
Fixed overheads other than depreciation on machines (per annum)	**₹54,000**	**₹28,000**
Variable expenses per bell	**₹4.00**	**₹5.00**
Depreciation on machine should be charged on straight line basis.		

Required:

(i) For each of the two levels of output namely 10,000 and 20,000 bells state with suitable workings whether the company should purchase the bells from market or install new equipment for manufacture of bells. If your decision is in favour of the installation of new equipment, which of the two new machines should be installed?

(ii) What would be your decision in case the forecast of requirement from the second year onwards is estimated at 40,000 bells instead of 20,000 bells.

(iii) At what volume of bells will the installation of the two machines break even.

(b) Company A can manufacture 1,000 units bicycles in a month for a fixed cost of ₹3,00,000. The variable cost is ₹500 per unit. Its current demand is 600 units which it sales at ₹1,000 per unit. It is approached by Company B for an order of 200 units of ₹700 per unit.

Should the Company A accept the order? Give your views as a CMA.

Answer:

3. (a) (i) Cost-Benefit Analysis of Two machines at Output Level of 10,000 and 20,000 units

Output Details	10,000 units		20,000 units	
	Super – X	Janta	Super – x	Janta
Cost of Buying	₹	₹	₹	₹
@ 8% from the Market	80,000	80,000	1,60,000	1,60,000
Cost of Manufacturing				
Variable Cost	40,000	50,000	80,000	1,00,000
Depreciation on Machine	30,000	20,000	30,000	20,000
Fixed Overhead	54,000	28,000	54,000	28,000
Total Cost	1,24,000	98,000	1,64,000	1,48,000
Decision	Buy from the market		Install Janata Machine	

(ii) Buy/Manufacture Decision at Level of 40,000 Units

	Super – X	Janata
Cost of Buying @ ₹8	₹3,20,000	₹3,20,000
Manufacturing Cost		
Variable Cost	1,60,000	2,00,000
Depreciation on Machinery	30,000	20,000
Fixed Overhead	54,000	28,000
Total Cost Manufacture	2,44,000	2,48,000
Cost Saving on Manufacture	76,000	72,000

Decision: As Super - X Machine results in higher cost saving. It should be installed at an estimated volume of 40,000 units.

(iii) Break – even volume of two machines
It is that volume of production at which a manufacturer is indifferent as to which machine he should install as total cost on both machine is the same. This point is known as cost indifference point.

Let Break-even volume = x units
Cost on super-X Machine for x units = 54,000 + 30,000 + 4x = 84,000 + 4x …(1)
Cost on Janata Machine for 'x' units = 20,000 + 28,000 + 5x = 48,000 + 5x …(2)

At cost indifference point total cost under two alternatives will be equal. Therefore,
84,000 + 4x = 48,000 + 5x or x = 36,000 units.
So at 36,000 units, the installation of the two machines will break even.

(b) The CMA will go ahead with the order because in his opinion the special order will yield ₹200 per unit. He knows that the fixed cost ₹3,00,000 is irrelevant because it is going to be incurred regardless of whether the order is accepted or not. Effectively, the additional cost which Company A would have to incur is the variable cost of ₹500 per unit. Hence, the order will yield ₹200 per unit (i.e. ₹700 - ₹500 of variable cost).

4. (a) A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. Budgeted factory costs and data on two products, X and Y, are shown below:

Product	Selling Price/Unit	Material Cost/Unit	Time in Facility A
X	₹35	₹20.00	5 minutes
Y	₹35	₹17.50	10 minutes

Budgeted factory costs per week:

	₹
Budgeted labour	**25,000**
Indirect labour	**12,500**
Power	**1,750**
Depreciation	**22,500**
Space costs	**8,000**
Engineering	**3,500**
Administration	**5,000**

Actual production during the last week is 4,750 units of product X and 650 units of product Y. Actual factory cost was ₹78,250.
Calculate:
(i) Total factory costs (TFC)
(ii) Cost per Factory Minute
(iii) Return per Factory Minute for both products
(iv) TA ratios for both products
(v) Throughput cost per the week
(vi) Efficiency ratio

(b) What is inter firm comparison?

Answer:

4. (a) (i) Total Factory Costs = Total of all costs except materials.
= ₹25,000 + ₹12,500 + ₹1,750 + ₹22,500 + ₹8,000 + ₹3,500 + ₹5000.
= ₹78,250

(ii) Cost per Factory Minute = Total Factory Cost ÷ Minutes available
= ₹78,250 ÷ 31,300 = ₹2.50

(iii) (a) Return per bottleneck minute for product X = $\frac{\text{Selling Price - Material Cost}}{\text{Minutes in bottleneck}}$
= (35 – 20) /5 = ₹3

(b) Return per bottleneck minute for product Y = $\frac{\text{Selling Price - Material Cost}}{\text{Minutes in bottleneck}}$
= (35 – 17.5) / 10 = ₹1.75

(iv) Throughput accounting (TA) Ratio for Product X = $\frac{\text{Return per Minute}}{\text{Cost per Minute}}$
= (3 / 2.5) = ₹1.2

Throughput Accounting (TA) Ratio for Product Y = $\frac{\text{Return per Minute}}{\text{Cost per Minute}}$
= (1.75 / 2.5) = ₹0.7

Based on the review of the TA ratios relating to two products, it is apparent that if we only made product Y, the enterprise would suffer a loss, as its TA ratio is less than 1. Advantage will be achieved, when product X is made.

(v) Standard minutes of throughput for the week:
= [4,750 x 5] + [650 x 10] = 23,750 + 6,500 = 30,250 minutes

Throughput cost per week:
= 30,250 x ₹2.5 per minutes
= 75,625

(vi) Efficiency % = (throughput cost / Actual TFC) %
= (₹75,625 / ₹78,250) x 100
= 96.6%

The bottleneck resource of Facility A is available for 31,300 minutes per week but produced only 30,250 standard minutes. This could be due to:
(a) The process of a 'wandering' bottleneck causing facility A to be underutilized.
(b) Inefficiency in facility A.

(b) Inter-firm comparison as the name denotes means the techniques of evaluating the performances, efficiencies, deficiencies, costs and profits of similar nature of firms engaged in the same industry or business. It consists of exchange of information, voluntarily of course, concerning production, sales cost with various types of break-up, prices, profits, etc., among the firms who are interested of willing to make the device a success. The basic purposes of such comparison are to find out the work points in an organization and to improve the efficiency by taking appropriate measures to wipe out the weakness gradually over a period of time.

5. (a) A Company with two manufacturing division is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used each unit of the product KLIM. As the demand for the product is not steady. Division B can obtain order for increased quantities only by spending more on sales promotion and by reducing the selling prices. The manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

Sales units per day	Average Selling price per unit of KLIM (₹)
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KLIM in Division B is ₹3,750 first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.
You are required:
(i) Prepare a schedule showing the profitability at each level of output for Division A and Division B
(ii) Find the profitability of the company as a whole at the output level which
(A) Division A's net profit is maximum.
(B) Division B's net profit is maximum.
(iii) If the company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit.

(b) Trimake Limited makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although and Activity Based Costing (ABC) system is being considered. Details of the three products, for typical period are:

	Labour Hours per	Machine Hours per unit	Material per unit	Volumes unit
Product X	½	1 ½	₹20	750
Product Y	1 ½	1	12	1,250
Product Z	1	3	25	7,000

Direct labour costs ₹6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹28 per machine hour.

You are required:

(a) To calculate the cost per unit for each product using conventional methods.

Further analysis shows that the total of production overheads can be divided as follows:

	%
Costs relating to set-ups	35
Costs relating machinery	20
Costs relating materials handling	15
Costs relating to inspection	30
Total production overhead	100%

The following activity volumes are associated with the product line for the period as a whole.

Total activities for the period

	Number of Set-ups	Number of movements of materials	Number of Inspections
Product X	75	12	150
Product Y	115	21	180
Product Z	480	87	670
	670	120	1,000

You are required:

(b) To calculate the cost per unit for each product using ABC principles; c) to comment on the reasons for any differences in the costs in your answers to (a) and (b).

Answer:

5. (a)

(i) Statement showing profit of division A:

Sale per day (units)	Sale Value	Cost	Profit/(loss)
	₹	₹	₹
1000	1200	1500	(300)
2000	2400	2400	-
3000	3600	3300	300
4000	4800	4200	600
5000	6000	5100	900
6000	7200	6000	1200

Profit of Division B:

No. of units	Sales	Transfer price	Other manufacturing cost	Total cost	Profit /(loss)
	₹	₹	₹	₹	₹
1000	5250	1200	3750	4950	300
2000	7960	2400	4500	6900	1060
3000	9900	3600	5250	8850	1050
4000	11120	4800	6000	10800	320
5000	12000	6000	6750	12750	(750)
6000	12060	7200	7500	14700	(2640)

(ii) Profitability of the company at the output level where division A's net profit is maximum:

	₹
Profit of division A at 6000 units	1,200
Profit of division B at 6000 units	(2,640)
Profit / (loss)	(1,440)
Division B's net profit is maximum:	
Profit of division A at 2000 units	-
Profit of division B at 2000 units	1,060
	1,060

(iii) When the company is not organized on profit centre basis
Profit at different level of output

Units	Division A	Division B	Total
	₹	₹	₹
1000	(300)	300	-
2000	-	1060	1060
3000	300	1050	1350
4000	600	320	920
5000	900	(750)	150
6000	1200	(2640)	(1440)

Best output level is 3,000 units

(b) (a) Computation of cost per unit using conventional Methods:

Total overheads	₹
X = 750 × 1.5 × 28 =	31,500
Y = 1250 × 1 × 28 =	35,000
Z = 7000 × 3 × 28 =	5,88,000
	6,54,500

Computation of cost

	X	**Y**	**Z**
	₹	₹	₹
Materials	20	12	25
Labour	3	9	6
Overheads	42	28	84
Factory Cost	**65**	**49**	**115**

(b) **Under ABC Costing**

		Setup Cost	**Machine Cost**	**Machine Handling Cost**	**Inspection Expenses**	**Total**
Cost	₹	2,29,075	1,30,900	98,175	1,96,350	6,54,500
Cost Driver		No. of setups	Machine hours	No. of Moment of Materials	No. of Inspection	
Cost driver rates	₹	341.90 (229075/670)	5.6 (130900 /23375)	818.125 (98,175 /120)	196.35 (196350 /1000)	

Cost per unit under ABC costing

	X		**Y**		**Z**	
	₹	₹	₹	₹	₹	₹
Materials		20.00		12.00		25.00
Labour		3.00		9.00		6.00
Overheads						
Setup Cost	34.19		31.45		23.44	

Machine cost	8.40		5.60		23.44	
Machine Handling Cost	13.09		13.74		10.17	
Inspection Cost	39.27	94.95	28.27	79.06	18.79	69.20
Total Cost		**117.95**		**100.06**		**100.20**

6. (a) The Everalert Ltd., which has a satisfactory preventive maintenances system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator required periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹15,000	0.3
₹20,000	0.4
₹25,000	0.3

The costs are expected to be almost linear, i.e., if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of maintenance. The probability distribution of breakdown cost is estimated as under:

Breakdown Costs per annum	Shutdown once a year	Shutdown twice a year
₹75,000	0.2	0.5
₹80,000	0.5	0.3
₹1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year?

(b) A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A:1,26,000 : Zone B:1,05,000 ; Zone C:84,000; Zone D:63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P:7; Salesman Q:5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

Answer:

6. (a)

Assigning random numbers to maintenance cost once a year basis:

Cost	Probability	Random Numbers (R.N.)
₹ 15,000	0.30	00-29
20,000	0.40	30-69
25,000	0.30	70-99

Assigning random numbers to breakdown costs when overhaulding is once a year basis:

Cost	Probability	R.N.
₹ 75,000	0.20	00-19
80,000	0.50	20-69
1,00,000	0.30	70-99

The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	27	₹15,000	03	₹75,000	₹90,000
2	44	20,000	50	80,000	1,00,000
3	22	15,000	73	1,00,000	1,20,000
4	32	20,000	87	1,00,000	1,20,000
5	97	25,000	59	80,000	1,05,000
			Average Annual Cost		1,06,000

Assigning random numbers to maintenance costs, on twice a year basis:

Cost	Probability	Random Numbers (R.N.)
₹ 30,000	0.30	00-29
40,000	0.40	30-69
50,000	0.30	70-99

Assigning random numbers to breakdown costs

Cost	Probability	Random Numbers (R.N.)
₹ 75,000	0.50	00-49
80,000	0.30	50-69
1,00,000	0.20	80-99

The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	42	₹40,000	54	₹80,000	₹1,20,000
2	04	30,000	65	80,000	1,10,000
3	82	50,000	49	75,000	1,25,000
4	38	40,000	03	75,000	1,15,000
5	91	50,000	56	80,000	1,30,000
			Average Annual Cost		1,06,000

[Note R.Ns. are taken from table]

Recommendation: From the above working it may be seen that shutdown maintenance/overhauling once a year will be more economical. The average annual cost will only be ₹1.06 lakhs as against 1.20 lakhs when shutdown is twice a year.

(b)

Sales Man	A	B	C	D
P	42	35	28	21
Q	30	25	20	15
R	30	25	20	15
S	24	20	16	12

Loss Matrix

0	7	14	21
12	17	22	27
12	17	22	27

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
1	4	8	12

Column Operation

[0]	3	6	9
0	1	2	3
0	1	2	3
0	[0]	0	0

[0]	2	5	8
0	[0]	1	2
0	0	1	2
1	0	[0]	0

[0]	2	4	7
0	[0]	0	1
0	0	[0]	1
2	1	0	[0]

P	→	A	-	42
Q	→	B	-	25
R	→	C	-	20
S	→	D	-	12
				99

× 3000 = ₹2,97,000 Maximum sales

7. (a) The following table gives data on normal time & cost and crash time& cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 – 2	6	600	4	1,000
1 – 3	4	600	2	2,000
2 – 4	5	500	3	1,500
2 – 5	3	450	1	650
3 – 4	6	900	4	2,000
4 – 6	8	800	4	3,000
5 – 6	4	400	2	1,000
6 – 7	3	450	2	800

The direct cost per day is ₹100

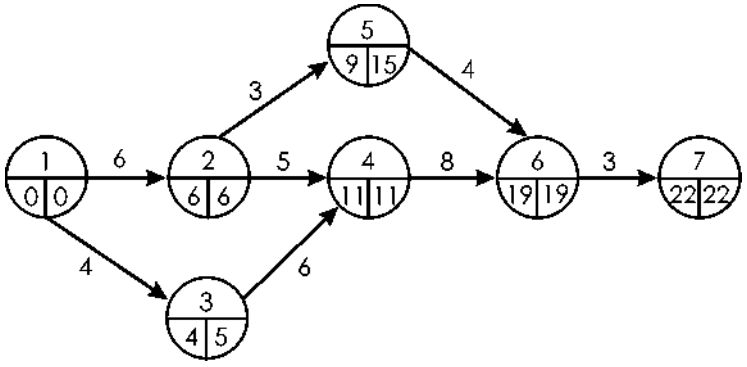
(i) Draw the network and identify the critical path

(ii) What are the normal project duration and associated cost?

(b) Four products A, B, C and D have ₹5, ₹7, ₹3 and ₹9 profitability respectively. First type of material (limited supply of 800 kg) is required by A, B, C, and D at 4 kg, 3 kg, 8 kg, and 2 kg, respectively per unit. Second type of material has a limited supply of 300 kg, and is for A, B, C, and D at 1 kg, 2 kg, 0 kg, and 1 kg per unit. Supply of other types of material consumed is unlimited. Machine hours available are 500 hours and requirements are 8, 5, 0, and 4 hours for A, B, C, and D each per unit. Labour hours are limited to 900 hours and requirements are 3, 2, 1 and 5 hours for it profitability? Formulate this as Linear Programming Problem. You are not required to solve the LPP.

Answer:

7. (a) (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



(ii) Normal project duration is 22 weeks and the associated cost is as follows: Total cost = Direct normal cost + Indirect cost for 22 weeks. = 4,700 + 100 × 22 = ₹6,900.

(b)

	Material I	Material II	Machine hours	Labour Hours
A	4	1	8	3
B	3	2	5	2
C	8	0	0	1
D	2	1	4	5
Max. availability	800	300	500	900

Let X1, X2, X3 and X4 are the quantity produced for products A, B, C and d respectively.

The objective function is –
Max. Z = 5X1 + 7X2 + 3X3 + 9X4

Subject to constraints
$4X_1 + 3X_2 + 8X_3 + 2X_4 \leq 800$ (Material I constraint)
$X_1 + 2X_2 + 0X_3 + X_4 \leq 300$ (Material II constraint)
$8X_1 + 2X_2 + 0X_3 + 4X_4 \leq 500$ (Machine hours constraint)
$3X_1 + 2X_2 + X_3 + 5X_4 \leq 900$ (Labour hours constraint)

And non-negativity constraints
$X_1, X_2, X_3, X_4 \geq 0$

8. (a) Cost Driver.
(b) Cost Control vs. Cost Reduction.
(c) Application of Simulation.
(d) Activity Based Management.
(e) Value Engineering.
(f) Skimming Pricing Policy.

Answer:

8. (a) Cost driver: Any element that would cause a change in the cost of activity is cost driver. Actually cost drivers are basis of charging cost of activity to cost object. Cost drivers are used to trace cost to product by using a measure of resources consumed by each activity. For example, frequency of order, number of order etc. may be cost driver of customer order processing activity. Cost driver may be involved two parts:
   1. Resource cost driver
   2. Activity cost driver

   A resource cost driver is a measure of the quantity of resources consumed by an activity. An activity cost driver is a measure of the frequency and intensity of demand, placed on activities by cost objects.

   The cost drivers for various functions i.e., production, marketing, research, and developments are given below.

Production	Number of units Number of set-ups
Marketing	Number of sales personnel Number of sales orders

(b) Cost Control Vs. Cost Reduction:
Both cost reduction and cost control are efficient tools of management but their concepts and procedure are widely different. The differences are summarized below:

Cost Control	Cost Reduction
(a) Cost control represents efforts made towards achieving target or goal.	(a) Cost reduction represents the achievement in reduction of cost
(b) The process of cost control is to set up a target, ascertain the actual performance and compare it with the target, investigate the variances, and	(b) cost reduction is not concern with maintenance of performance according to standard take remedial measures.
(c) cost control assumes the existence of standards or norms which are not challenged	(c) cost reduction assumes the existence of concealed potential savings in standards or norms which are therefore subjected to a constant challenge with a view to improvement by bringing out savings
(d) Cost control is a preventive function. costs are optimized before they are incurred	(d) Cost reduction is a corrective function. It operates even when an efficient cost control system exists. there is room for reduction in the achieved costs under controlled conditions
(e) cost control lacks dynamic approach	(e) Cost reduction is a continuous process of analysis by various methods of all the factors affecting costs, efforts and functions in an organization. the main stress is upon the why of a thing and the aim is to have continual economy in costs

(c) **Application of Simulation**

(i) Scheduling aircraft,
(ii) Job-ship scheduling and personnel scheduling,
(iii) Manpower-hiring decisions,
(iv) Traffic light-timing,
(v) Transport-scheduling,
(vi) Evaluating alternative investment opportunities, and
(vii) Design of parking lots, harbor, and communication systems etc.

(d) Activity-based management (ABM) is a method of identifying and evaluating activities that a business performs using activity-based costing to carry out a value chain analysis or a re-engineering initiative to improve strategic and operational decisions in an organization.

ABC is not a method of costing, but a technique for managing the organisation better. It is a one-off exercise which measures the cost and performance of activities, resources and the objects which consume them in order to generate more accurate and meaningful information for decision-making. ABM draws on ABC to provide management reporting and decision making. ABM supports business excellence by providing information to facilitate long-term strategic decisions abo.

(e) **Value Engineering**

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Society of Japanese Value Engineering defines VE as:

"A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost".

Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering." It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheapen" the product or service, nor does it "cut corners."

Value Engineering simply answers the question "what else will accomplish the purpose of the product, service, or process we are studying?" VE technique is applicable to all type of sectors. Initially, VE technique was introduced in manufacturing industries. This technique is then expanded to all type of business or economic sector, which includes construction, service, government, agriculture, education and healthcare.

(f) Price skimming is a pricing strategy which companies adopt when they launch a new product, in this strategy while launching a product company sets high price for a product initially and then reduce the price as time passes by so as to recover cost of a product quickly.

An example of price skimming would be mobiles which have some added features and due to those features they are sold initially at higher prices and then prices began to decline as time passes by, another example of price skimming would be 3D televisions which are right now being sold.

Advantages

1. Price skimming helps the company in recovering the research and development costs which are associated with the development of new product.
2. If the company caters to consumers who are quality conscious rather than price conscious than this type of strategy can work in a great way for a company.