

PAPER – 5 : COST MANAGEMENT

Question No. 1 is compulsory.

Answer any **five** from the remaining six questions.

Working notes should form part of the answer.

Question 1

- (a) The standard cost for producing 180 kgs of a product whose raw material inputs are A and B is given below:

Standard Cost (`)	
Material A 60 kgs @ `10 per kg	600
Material B 140 kgs @ ` 2 per kg	<u>280</u>
	<u>880</u>

The actual prices of A and B were `12 and ` 8 per kg respectively. Consumption of B was 108kg. The actual output at 80% yield was 144 kg.

Calculate the following direct material variances:

- (i) Mix variance
- (ii) Yield variance
- (iii) Price variance
- (iv) Usage variance

(5 Marks)

- (b) Sportswear Ltd. manufactures sportswear shirts and shorts. The production budget for these two products has to be prepared for the next three months, November 2010, December 2010 and January 2011.

The following information is given:

- (i) Sales volume every month will be 2% more than the previous month's volume for each product.
- (ii) The company carries stock of finished garments sufficient to meet 40% of the next month's sale.
- (iii) Closing stock for October 2010 was 6000 shirts and 8000 shorts.

You are required to prepare the production budget for each product for November, December 2010 and January 2011.

(5 Marks)

- (c) A factory has a special offer to produce 4 units of a labour intensive product by using its existing facilities after the regular shift timings. The product can be produced by using only overtime hours which entails normal rate plus 25% , so that usual production is not affected. Two workers are interested in taking up this additional job every evening after their usual shift is over. One is an experienced man who has been working on a similar product. His normal wages are ` 48 per hour. The other worker is a new person who

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earns ₹ 42 an hour as normal wages. He can be safely considered to have a learning curve ratio of 90% for this work. The company wants to minimize labour cost for the order and only one person is to be chosen for the job. The experienced man will take 20 hours for the first unit while the new worker will take 30 hours for the first unit. Evaluate who should be chosen for the job. (5 Marks)

- (d) You are given the following linear program. Introduce appropriate variables and restate the problem to set up the simplex tableau. (Do not attempt further solution.)

Maximise :

$$8x_1 + 4x_2 - 3x_3 + 10x_4$$

s.t.

$$2x_1 - x_2 + x_3 + 2x_4 \leq 40$$

$$3x_1 - x_3 + x_4 \leq 90$$

$$2x_1 + x_2 + x_4 = 60$$

$$x_1, x_2, x_3, x_4 \geq 0$$

(5 Marks)

Answer

- (a) Actual output = 144 Kg

Actual Yield = 80 %

$$\text{Actual input} = \frac{144}{80\%} = 180 \text{ kg}$$

$$B = 108 \text{ kg}, A = 180 - 108 = 72 \text{ kg}$$



Material	Std. Price ' Qty. for Actual Output	Std. Price ' Actual Qty in Std. ratio or Revised Std. Qty.	Std. Price ' Actual Qty.	Actual Price ' Actual Qty.
A	10 ' 48 = 480	10 ' 54 = 540	10 ' 72 = 720	12 ' 72 = 864
B	2 ' 112 = <u>224</u>	2 ' 126 = <u>252</u>	2 ' 108 = <u>216</u>	8 ' 109 = <u>864</u>
	704	792	936	1728

- (i) Material Mix Variance

$$(\text{Revised Standard Quantity} - \text{Actual Quantity}) \times \text{Standard Price} \\ = (792 - 936) = 144 \text{ (A)}$$

- (ii) Material Yield Variance

$$(\text{Std. Yield} - \text{Actual Yield}) \times \text{Std. Cost Per Unit} \\ = (162 - 144) \times 4.88888 = 88 \text{ (A)}$$

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(iii) Material Price Variance

$$= (\text{Std. Price} - \text{Actual Price}) \times \text{Actual Quantity}$$

$$= (936 - 1728) = 792 \text{ (A)}$$

(iv) Material Usage Variance

$$= (\text{Std. Qty. for Actual Output} - \text{Actual Quantity}) \times \text{Std. Price}$$

$$= (704 - 936) = 232 \text{ (A)}$$

Verification : *Material Cost Variance = Material Price Variance + Material Mix Variance
+ Material Yield Variance

$$= 792 \text{ (A)} + 144 \text{ (A)} + 88 \text{ (A)}$$

$$1024 \text{ (A)} = 1024 \text{ (A)}$$

* Material Cost Variance = (Std. Cost of Actual Output – Actual Cost)

$$= (704 - 1728) = 1024 \text{ (A)}$$

(b)

	Shirts				Shorts			
	Nov.	Dec.	Jan.	Feb.	Nov	Dec.	Jan.	Feb.
Closing Stock (40% of next sales)	6120	6242	6367	-	8160	8320	8490	-
Sales	<u>15000</u>	<u>15300</u>	<u>15606</u>	15919	<u>20000</u>	<u>20400</u>	<u>20800</u>	21224
Total	21120	21542	21973		28160	28720	29290	
Op. Stock	<u>6000</u>	<u>6120</u>	<u>6242</u>		<u>8000</u>	<u>8160</u>	<u>8320</u>	
Production	15120	15422	15731		20160	20560	20970	

	Shirts		Shorts	
Opening stock	6000		8000	
Sales				
November	$\frac{6000}{40\%}$	= 15,000	$\frac{8000}{40\%}$	= 20,000
December	1.02 x 15,000 = 15,300		1.02 X 20,000 = 20400	
January	1.02 x 15,300 = 15,606		1.02 X 20,400 = 20,808	
February	1.02 X 15, 606 = 15, 919		1.02 X 20,808 = 21,224	

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Alternative:

	Opening Stock Shirts = 6000 = 40% of November Sales	Opening Stock of Shorts = 8000 = 40% of November Sales
November sales	$\frac{6000}{40\%} = 15,000$	$\frac{8000}{40\%} = 20,000$
Dec. Sales	$1.02 \times 15,000 = 15,300$	$1.02 \times 20,000 = 20,400$
Closing Stock November	$40\% \times 15,300 = 6,120$	$40\% \times 20,400 = 8,160$
November Production = Closing Stock + sales – Opening stock	15,120	20,160
December Production	$1.02 \times 15,120 = 15,422$	$1.02 \times 20,160 = 20,560$
January Production	$1.02 \times 15,422 = 15,731$	$1.02 \times 20,560 = 20,970$

- (c) Overtime rate – Experienced man $48 \times 125\% = \text{Rs } 60.00$
 Overtime rate New $42 \times 125\% = \text{Rs } 52.50$
 Time for 4 units for experienced man = $4 \times 20 = 80$ hrs (working note II)
 Cost = $80 \text{ hrs} \times 60 = \text{Rs } 4800$.
 Time for 4 units for New comer = $4 \times [30 \times .9 \times .9] = 97.2$ hrs.(working note I)
 Cost = $97.2 \times 52.5 = \text{Rs. } 5103$
 The experienced man must be chosen for getting lower costs.

Working Note

1. (New Comer)

- 1st unit 30 hrs
 2nd units $30 \times .9 = 27$ hrs
 4th units $27 \times .9 = 24.3$ hrs/unit
 \ For 4 units, $4 \times 24.3 = 97.2$ hrs.

2. Learning curve does not apply to the experienced man.

- (d) Maximize $z = 8x_1 + 4x_2 - 3x_3 + 10x_4 + Os_1 - Ma_1 - Ma_3 + Os_2$

$$2x_1 - x_2 + x_3 + 2x_4 - s_1 + a_1 = 40$$

$$3x_1 - x_3 + x_4 + s_2 = 90$$

$$2x_1 - x_2 + x_4 + 2x_4 + a_3 = 60$$

$$x_1, x_2, x_3, x_4, s_1, s_2, a_1, a_3 \geq 0$$

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Question 2

- (a) M Ltd. makes two products, X and Y, in their respective divisions. Each unit of Y needs one unit of X. Divisions X and Y are profit centres and can function according to their divisional interests.

In the external domestic market, X can sell either 6000 units at ₹1,000 per unit or 5000 units at ₹1,120 per unit.

X has a production capacity of 7000 units, with each unit requiring 2 hours.

Y also has a production and demand of 7000 units.

Y can buy product X from outside as follows:

Order Quantity	Price for the entire order
(Units)	(₹ /u)
6001 – 7000	900
4001 – 6000	920
2001 – 4000	1,000
0 – 2000	1,120

Y resorts to bulk purchase to avail maximum possible discount.

- (i) There is an export order (that may either be fully accepted or fully rejected) for X to supply 800 units @ ₹900 per unit.
- (ii) There is an offer to hire out X's capacity of 1600 hours at ₹130 per hour. The hiring offer may either be fully accepted or fully rejected.
- (iii) Y will not buy from X at any price more than it will incur in the outside market. Y does not place restrictions on quantities to be supplied by X, provided its pricing condition is not violated.

Given that any one or more of the offers may be accepted, what will be X's best strategy?

What will be the corresponding transfer price?

[A detailed cost statement is not essential. Only figures relevant for decision making are required to be considered under each analysis.] (9 Marks)

- (b) State the pricing strategy that you would advise in the following situations which are independent of each other:
- (i) A new product is to be launched. It has had high promotional expenditure and its demand in the market is not known.
- (ii) A new product is to be launched. It is to be mass manufactured.
- (iii) A product which has an external market demand is to be transferred to another division of the same company. For the external market, variable selling costs of ₹

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10 per unit and fixed selling costs amounting to ` 10 lacs p.a. are incurred. These costs are not applicable to divisional transfers. The divisional transfer can take up only 20% of the output produced.

- (iv) *A special one-time order for the use of idle capacity is offered. This order will not impact the existing sales of the company. The product has competition in the market.*
- (v) *There is stock of a discontinued product. It has severe competition and the product is perishable.* (7 Marks)

Answer

- (a)** Capacity of X division = 7000 units

X has the following option to sell following number of units:

Option	Domestic Market	Export	Transfer	Hiring out (equivalent unit)
I	6000	800	200	
II	5000	800	1200	
III	5000		2000	
IV	5000	800	400	800

According to the condition given in (iii) for procurement policy of Y,

For 7000 units, maximum amount Y is agreeable to pay at market rate i.e Rs 900 per unit

$$= 7000 \times \text{Rs } 900 = \text{Rs } 63,00,000$$

If X transfers 1200 units to Y, It has to incur expenses for 5800 units from market =

$$= 5800 \times \text{Rs } 920 = \text{Rs } 53,36,000$$

It means for 1200 units from X, Y will pay = Rs (63,00,000 – 53,36, 000)

$$= \text{Rs } 9,64,000 = \text{Rs } 803.33 \text{ per unit}$$

If X transfers 2000 units to Y and Y buys 5000 units,, Y can pay to X only

$$= \text{Rs } (63,00,000 – 5000 \times 920) = \text{Rs } 17,00,000 = \text{Rs } 850.00 \text{ per unit}$$

If transfer of less than 1000 units to Y, X can claim transfer price of Rs 900 per unit

		Realization (Rs)
Option I	$6000 \times 1000 + 800 \times 900 + 200 \times 900$	Rs 69,00,000
Option II	$5000 \times 1120 + 800 \times 900 + 1200 \times 803.33$	Rs 72,84,000
Option III	$5000 \times 1120 + 2000 \times 850$	Rs 73,00,000
Option IV	$5000 \times 1120 + 800 \times 900 + 400 \times 900$ plus contribution from hiring out	Rs 66,80,000 plus

Above table shows that Option III is preferable in comparison to Option I and II .

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If Option III for X, transfer price will be Rs 850.00 per unit.

For taking a decision on option IV, contribution from equivalent unit from hiring out has to be compared with contribution from minimum sales realization of Rs 775 because sales realization of Rs 775 per unit from equivalent 800 units gives the amount of Rs 6,20,000 which makes up the gap between option III and option IV. In that case, transfer price will be Rs 900 per unit.

- (b) (i) Skimming price because demand is likely to be inelastic and high price will enable to recover initial high promotional expenses.
- (ii) Penetrating price : charging low price to penetrate the market.
- (iii) External market price less variable selling cost of Rs. 10 per unit.
Fixed selling costs are irrelevant
- (iv) Variable cost + reasonable mark-up, upto what the order can offer.
The minimum would be variable cost
- (v) If the product can be absorbed by the market at slightly less than market price, it is acceptable. Otherwise, even a price below variable cost will be alright since the product is perishable and future sales do not exist due to discontinuance.

Question 3

- (a) ABC Ltd. manufactures four products A, B, C & D in the same factory. The following information is given for a certain period:

Product	A	B	C	D
Good output (No. of units)	720	600	480	504
Average yield (5%)	80	80	96	90
Machine hours per unit of input	4	3	2	1

The plant works such that after machining, the defectives in each run are automatically segregated and dumped separately in a container. The good units pass through the process and are further checked for quality by the inspectors of quality control who charge by the number of batches inspected.

The total production and selling overheads of the company are the following for the period:

Machine operation and maintenance	66,375
Set up costs	19,200
Stores receiving	21,400
Inspection	24,000

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Finished goods – packing /dispatch 14,400

The following additional information is given:

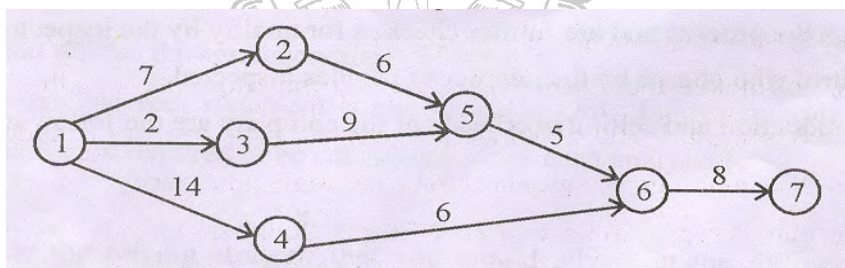
- (i) A material requisition is made for every 25 units of input.
- (ii) Machines need to be set up and tuned after each production run.
- (iii) Production is in batches of 24 good units for all the products.
- (iv) Units of A and B are packed in boxes that have 24 units capacity each and C & D are packed in smaller boxes of 12 units capacity. The smaller box costs half the price of the bigger box.

Each box contains only one type of product. There is no product mix up in packing.

Choose appropriate activity cost drivers for each overhead cost and calculate the overhead cost per unit of good output for each of the products under the ABC system.

(9 Marks)

- (b) At the end of activity 6-7, a product is to be launched and the date has been announced for the inaugural function, based on the normal duration of activities as given in the network below. Activities have been subcontracted by the project manager to contractors A, B, C, D, E, F, G & H as indicated in the table below. Each subcontractor offers a discount on his contract price for each day given to him in addition to the normal days indicated in the network. What will be the maximum discount that the project manager may earn for the company without delaying the launch of the product?



Activity	Contractor	Discount ` /Day
1-2	A	300
1-3	B	200
1-4	C	1,200
2-5	D	500
3-5	E	400
4-6	F	1,000
5-6	G	600
6-7	H	500

(7 Marks)

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Answer

(a) Table 1 : Calculation of cost driver quantity

	A	B	C	D	Total
(a) Output good units	720	600	480	504	
(b) Average Yield (%)	80	80	96	90	
(c) Input	900	750	500	525	2675
(d) No. of batches/production runs (a) ÷ 24	30	25	20	21	96
(e) No. of matt. Requisition (c) ÷ 25	36	30	20	21	107
(f) No. of boxes packed (a ÷ 24)(a ÷ 12)	30	25			
(g) No. of equivalent boxes packed	30	25	20	21	96
(h) Machine hrs/unit of output	4	3	2	1	
(i) Machine hrs for product (h) x (c)	3600	2250	1000	525	7375

Table 2: Calculation of cost driver quantity and rate

Overhead Cost	Amount (Rs)	Cost Driver	Cost Driver Qty.	Cost driver rate
M/c Operation	66375	M/c hours per product	7375	9
Sep up Cost	19200	No. of set ups or production runs	96	200
Stores receiving	21400	No. of requisitions	107	200
Inspection	24000	No. of production runs	96	250
Finished goods packing/despach	14400	No. of equivalent boxes	96	150

Table 3: Allocation of Indirect Expenses on the basis of relevant cost driver

	Ratio (Table 1)	A	B	C	D	Total
M/c operation	(i)	32400	20250	9000	4725	66375
Set up Costs	(d)	6000	5000	4000	4200	19200
Stores Receiving	(e)	7200	6000	4000	4200	21400
Inspection	(d)	7500	6250	5000	5250	24000
Finished goods packing	(g)	<u>4500</u>	<u>3750</u>	<u>3000</u>	<u>3150</u>	<u>14400</u>
Overhead Costs		57600	41250	25000	21525	145375
Good units		720	600	480	504	
Overhead cost per good unit		80	68.75	52.08	42.71	

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(b)

Paths		Days	Extension possible
X:	1-2-5-6-7	7+6+5+8 = 26	2 days
Y:	1-2-3-5-6-7	2+9+5+8 = 24	4 days
Critical path	1-4-6-7	14+6+8 = 28	Nil

	1-2	2-5	3-5	5-6
X		500		
	200			600
Y			400	

Activity 5-6 is common for both the paths X and Y. It is better to extend other activities.

Path	Activity	Contractor	No of days	Discount per day (Rs)	Total Discount (Rs)
X	2-5	D	2	500	1000
Y	3-5	E	4	400	1600
				Max discount	2600

Question 4

- (a) The manager of a hotel providing lodging facilities wants to expand his services to include manual booking (reservation or cancellation) of railway tickets for his clients. He does not want to have electronic booking due to operational difficulty. He has the following information:

	₹/Month
Proportion of rent allocated for office space	4,000
General Telephone expenses allocated to this service	2,400
Proportion of security charges/maintenance expenses allocated	1,600
Salary to person exclusively doing the booking of tickets	20,000
Mobile phone charges exclusive to person booking ticket	3,000
Share of general miscellaneous fixed expenses allocated	1,000
Conveyance incurred to book tickets (to and fro charges to the nearest booking station) [fixed per month]	4,000

The manager estimates that there will be 2,500 bookings per month for 3 months of peak season. 1,000 bookings per month for 2 months of moderate business and 700 bookings per month during the remaining period. He cannot charge more than the prevailing rate of ₹ 30 per booking charged by other agents.

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Calculate the total cost per booking.

What is the estimated profit the manager hopes to achieve for the full year?

What should be the average minimum volume to justify the setting up of the new service?

(Detailed break-up of monthly revenues or costs is not essential.) (7 Marks)

- (b) A manufacturing company makes 4 products that are sold through 8 regional offices countrywide. The products pass through 3 production processes in a factory. A separate market research division monitors outside competition. This division is outside the sales management hierarchy.

As a management accountant, suggest some routine reports for performance measurement to be made to:

(a) The Sales Management

(b) The Works Manager

(9 Marks)

Answer

(a)

Costs specific to booking operations:

Direct person's salary	20,000	
Mobile expenses	3,000	
Conveyance	<u>4,000</u>	27,000
Share of other overheads:		
Office space	4,000	
General Telephone	2,400	
Security/Maintenance	1,600	
Miscellaneous Expenses	<u>1,000</u>	<u>9,000</u>
Total Cost allocated to the service		<u>36,000</u>

$$\text{Average demand per month} = \frac{2500 \times 3 + 1000 \times 2 + 700 \times 7}{12} = 1200$$

$$\text{Total Cost per booking} = \frac{\text{Total Cost per month}}{\text{average bookings per month}} = \frac{36,000}{1,200} = 30 \text{ Rs}$$

$$\text{Revenue per ticket} = \text{Rs. } 30$$

$$\text{Total revenue less total cost} = 30 - 30 = 0$$

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Assuming that other overheads will anyway exist even if the service is not provided, the manager can hope to achieve a profit of Rs. 30x 1,200 - 27,000 is Rs. 9,000 for the full year.

Minimum average volume to set up the service will be the amount needed to recover the specific costs of this service, is 27,000 per month.

$$\text{Minimum average bookings} = \frac{27,000}{30} = 900 \text{ bookings}$$

(b) (a) To Sales Management

- (i) Actual vs budgeted sales showing quantity, price and value
 - product wise
 - region wise
 - salesmen wise
 - customer wise.(any 2 of the above)
- (ii) Productwise standard profit and loss
 - for fixing selling prices
 - to concentrate on sales of more profitable products
- (iii) Analysis of selling expense in relation to budgeted expenses and sales value
 - product wise, region wise
- (iv) Bad debts and Accounts which are slow and difficult in collection
- (v) Status report on new or doubtful customers

(b) To works Manager

- (i) Product wise/Process wise operating statement
- (ii) General works Operating statements under suitable classification of expenses (items not directly controllable by depts., but relating to works expenses)
- (iii) Plant utilization report
- (iv) Department wise scrap report
- (v) Material usage report
- (vi) Machinery failure report
- (vii) Summary of plant wise labour efficiency
- (viii) Plant accident report

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Question 5

- (a) A company has 3 factories F_1 , F_2 and F_3 which supply the same product to 5 agencies, A_1 , A_2 , A_3 , A_4 and A_5 . Unit production costs, shipping costs and selling prices differ among the different sources and destinations and are given below:

	F ₁		F ₂		F ₃
Production Cost (` /Unit)	28		35		29
Production Capacity (No. of units)	110		240		125
Agencies	A ₁	A ₂	A ₃	A ₄	A ₅
Selling Price (` /Unit)	40	48	42	45	41
Demand (No. of units)	80	100	75	45	125

Shipping Costs ₹/Unit

	A_1	A_2	A_3	A_4	A_5
F_1	3	9	8	12	8
F_2	6	10	6	2	5
F_3	3	10	3	6	8

- (i) Set up the initial transportation matrix for minimization.
- (ii) After doing (i) above, you are given the following additional information:
- 40 units must be transported from F_2 to A_2 as per an earlier agreement made by F_2 with A_2 's customer. This quantity is included in the figures given for total production and demand at these locations.
 - Not more than 30 units may be sent from F_1 to A_1 , since the transporter's vehicle lacks space in this route.

Incorporating conditions (a) and (b) above, obtain the initial solution by Vogel's Approximation Method. (Do not attempt to continue for the full and final solution.)

(10 Marks)

- (iii) After doing the initial solution as in (ii) above, you are informed that the route from F_2 to A_1 is blocked by sudden flooding of the roads.

Without actual re-calculation, briefly explain how your solution is likely to be affected.

(10 Marks)

- (b) The selling price per unit of a product is ₹ 14. For the forthcoming period, the demand will be only 5,000 units. The fixed expenses at 50% activity (5,000 units) will be ₹ 30,000. The company is thinking of shutting down operations, in which case an

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additional amount of ₹ 2,000 will have to be incurred for shutting down and only 20,000 of the above fixed costs can be avoided.

What should be the variable cost per unit to recommend a shut down? (6 Marks)

Answer

(a)

Cost Matrix (Production + Shipping Cost)					
	A ₁	A ₂	A ₃	A ₄	A ₅
F ₁	31	37	36	40	36
F ₂	41	45	41	37	40
F ₃	32	39	32	35	37
Contribution Matrix (Selling Price-Cost Matrix)					
	A ₁	A ₂	A ₃	A ₄	A ₅
F ₁	9	11	6	5	5
F ₂	-1	3	1	8	1
F ₃	8	9	10	10	4

Minimisation Matrix. (Subtract each element of the above matrix from the largest element)

	A ₁	A ₂	A ₃	A ₄	A ₅	Supply
F ₁	2	0	5	6	6	110
F ₂	12	8	10	3	10	240
F ₃	3	2	1	1	7	125
Demand	80	100	75	45	125	475
						425

This is not a balanced transportation matrix. Hence add a dummy agency A_{6s} with demand 50 and zero for costs.

	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	Supply
F ₁	2	0	5	6	6	0	110
F ₂	12	8	10	3	10	0	240
F ₃	3	2	1	1	7	0	125
Demand	80	100	75	45	125	50	475

Incorporating condition (a) of (ii), the 40 units are compulsory and can go out of the minimization effort. Consequently,

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	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	Supply
F ₁	2	0	5	6	6	0	110
F ₂	12	8	10	3	10	0	200
F ₃	3	2	1	1	7	0	125
Demand	80	60	75	45	125	50	435

Condition (b) needs to be tackled while allotting the quantities using the least cost differences.

		A ₁	A ₂	A ₃	A ₄	A ₅	A ₆		Diff.
	F ₁	2	0	5	6	6	0	110	0 2 4
	F ₂	12	8	10	3	10	0	200	3 5 2
	F ₃	3	2	1	1	7	0	125	1 1 4
		80	60	75	45	125	50	435	
Diff		1	2	4	2	1	0		

Step (I) allot 75 units to least cost cell F₃ A₃ since 4 is the max difference.

Step (II) allot 50 units to least cost cell F₂ A₆ since 3 is the max. difference.

Step (III) allot 45 units to least cost cell F₂ A₄ since 5 is the max. difference.

Step (IV) Max. difference has a tie at 2. Hence allot 60 units to least cost cell F₁ A₂

Step (V) Max. difference has a tie between F₁ A₁ and F₁ A₅. Choose F₃ A₁ with least cost. But as per condition.

(b) of (ii) we can allot only 30 units instead of 50. Next, F₃ A₁ is given the balance possible demand is 50 units. This also exhausts supply F₃

Step (VI) only F₁A₅ is left out. Hence allot 20 to finish the supply.

Step (VII) Allot 105 to F₂ A₅ and obtain the b initial solution by VAM.

	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	
F ₁	30	60			20		110
F ₂		40		45	105	50	240
F ₃	50		75				125
	80	100	75	45	125	50	475

(iii) The initial solution does not have F₂ to A₁ as a possibility. It is not likely to appear in the final solution also, since in the contribution matrix, it is the worst or in the cost matrix the worst with highest cost. Hence it is like eliminating a prohibited route with high cost M.

Therefore, floods or not, this route will not impact the solution.

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(b)

	Continue	Shut Down
Fixed expenses at 50% activity	30,000	-
Additional shut down cost		2,000
Fixed expenses during shut down	<u>30,000</u>	<u>10,000</u>
		12,000

Additional fixed cost incurred due to continued operations = 18,000

If contribution from operation is less than 18,000, a shut down is recommended.

$$\text{i.e. Contribution per unit} < \frac{18,000}{5,000}$$

$$\text{i.e. Contribution} < \text{Rs 3.60 per unit}$$

$$\text{i.e. Selling price} - \text{variable cost} < \text{Rs 3.60 per unit}$$

$$\text{or S.P.} - 3.6 < \text{Variable cost}$$

$$\text{i.e. } 14.00 - 3.60 < \text{Variable Cost}$$

or variable cost is more than Rs 10.40

For a variable cost more than Rs 10.40 per unit, a shut down is recommended.

Alternative

Contribution from operation must be less than 18,000 Rs. for a shut down.

$$\text{Sales value} = 14 \times 5,000 = 70,000$$

$$\text{Sales} - \text{variable cost} < 18,000$$

$$\text{or variable cost is more than } 70,000 - 18,000 = 52,000$$

Variable cost of 5,000 units above Rs. 52,000

$$\text{Or Variable Cost V.C. per unit} > \frac{52,000}{5,000} = \text{Rs. 10.40}$$

For a variable cost per unit above Rs. 10.40, shut down is recommended.

Question 6

- (a) Aero Ltd. has hired an aircraft to specially operate between cities A and B. All the seats of the aircraft are economy class.

The following information is available:

Seating capacity of the aircraft	= 320 passengers
Average number of passengers per flight	= 240 passengers
Average one way fare from A to B	= ` 5,000 per passengers

PAPER – 5 : COST MANAGMENT

Variable fuel costs per flight from A to B	₹ 90,000
Food Cost (no charge to passenger)	₹ 300 per passenger
Commission to travel agents (All tickets are through agents)	10% of the fare
Annual lease costs allocated to each flight	₹ 2,00,000
Ground services, baggage handling / check in services costs per flight A to B	₹ 40,000
Flight crew salaries per flight A to B	₹ 48,000

There is an offer from another airlines operator, Mid air Ltd. for a stop-over at destination D, which is on the way from A to B. Due to this, the flight will operate from A to D, then D to B.

The following terms are to be considered for the stop-over:

50 seats will be booked by Mid Air at ₹ 2,500 per ticket, whether or not Mid Air is able to sell them to its customers. No agents' commission is payable on these tickets.

60 new passengers will be booked by Aero's travel agents for travel from A to D at a fare of ₹ 2,000 per passenger.

Since the stop-over wastes more time, 25 of Aero's original passengers from A to B will drop out and seek other airlines which fly directly from A to B.

Due to the stop-over, fuel costs will increase from ₹ 90,000 to ₹ 1,35,000, Additional airport landing/baggage handling charges of ₹ 19,000 per stop-over will have to be incurred by Aero Ltd.

Aero Ltd. will have to serve snacks to all passengers in the D to B sector at no charge to passenger. Each snack will cost Aero Ltd ₹ 200. This will be in addition to the original food at ₹ 300 served in the A to D sector.

You may assume that fuel costs are not affected by the actual number of passengers in a flight. You may ignore non-financial considerations, additional wear and tear to aircraft due to extra landing/take-off.

Without considering Mid Air's offer,

- (i) What is the profit earned by Aero Ltd. per flight from A to B?
- (ii) What is the break-even number of passengers for each flight from A to B?

Considering the effects of Mid Air's offer,

- (iii) Evaluate whether Aero should accept the offer.

(A detailed profitability statement is not essential, a relevant cost-revenue analysis would suffice). (12 Marks)

- (b) How can simulation be applied in practical situations? (4 Marks)

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Answer

- (a) (i) With respect to the passenger, the only variable costs are :
- | | | |
|-------------------------------|----------------|--|
| 10% Commission on fare | Rs. 500 | |
| Food | Rs. <u>300</u> | |
| Total variable cost/passenger | Rs. 800 | |
- Revenue per passenger = gross fare = 5000
 Contribution = 5000 – 800 = Rs. 4200
- | | | |
|--------------------|------------|-----------|
| Total Contribution | 4200 x 240 | 10,08,000 |
|--------------------|------------|-----------|
- Less: Costs/flight
- | | | |
|-------------------|---------------|-----------------|
| Fuel | 90,000 | |
| Lease | 2,00,000 | |
| Baggage | 40,000 | |
| Flight Crew | <u>48,000</u> | <u>3,78,000</u> |
| Profit per flight | | <u>6,30,000</u> |
- (ii) Cost per flight Rs. 3,78,000 are fixed in relation to the number of passengers.
- B.E. = $\frac{3,78,000}{4200} = 90$ passengers
- Effect of Mid Air's offer
- | | | |
|----------------------------|--------------|------------|
| A to D | Fare | Rs 2000 |
| | Less: Comm. | <u>200</u> |
| | | 1800 |
| | Less: Snacks | <u>300</u> |
| Contribution per passenger | | 1500 |
- | | | |
|---|-----------------------|-------------------------|
| | Additional Cost (Rs) | Additional Revenue (Rs) |
| 50 seats x 2500 (D to B) | | 1,25,000 |
| Fuel | 45,000 | |
| Baggage | 19,000 | |
| Snacks @ Rs 200 for passenger (240 -25+ 50): | | |
| 200 x [240 – 25 + 50] | 53,000 | |
| Additional Contribution (A to D) 60 x 1500 | | 90,000 |

PAPER – 5 : COST MANAGMENT

Contribution lost (A to B) : 25 x 4200 (opportunity cost)	1,05,000	
	<u>2,22,000</u>	<u>2,15,000</u>

Aero will loose Rs. 7,000 per flight if it accepts Mid Air's offer.

Decision : Reject Mid Air's offer.

(b) Simulation may be applied in the following areas:

- (i) Inventory control – Raw material spares
Demand simulated and reorder point determined.
- (ii) Inventory – of finished goods – how much to produce, by simulating external demand.
- (iii) Waiting time for servicing by simulating arrival and service times.
Used by banks, doctors, etc.
- (iv) Checking defectives and determining percentage to formulate standards.

Question 7

Answer any **four** of the following:

- (a) Discuss the impact of JIT systems on overhead costs. (4 Marks)
- (b) What are benefits of Enterprise Resource Planning? (4 Marks)
- (c) A company's four products, M, N, O and P are in the market. Identify the phase of life cycle for each product with a brief reason.

M : There is a lot of competition. Quantity sold has been increasing at 10% 8% and 7% in the last 3 years.

N : Until last year, N had no competition. Suddenly the company finds 4 new products very similar to N in the market. However, N continues to have good sales.

O : there is intense competition. Suddenly the company finds 4 new products very similar to N in the market. However, N continues to have good sales.

P : Huge inventory of P is available. P is being sold, but there are many products in the market which are priced lesser than P, but have the same utility as P.
- (d) Three different salesmen X, Y and Z are to be assigned three different regions A, B and C so that the company's revenue is maximised. The following matrix gives the sales revenue:

	X	Y	Z
A	10	60	30
B	20	30	15
C	60	40	10

You are required to use the assignment technique to maximise revenue. (4 Marks)

- (e) TP Ltd. produces a product which passes through two processes – cutting and finishing.

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The following information is provided:

	Cutting	Finishing
Hours available per annum	50,000	60,000
Hours needed per unit of product	5	12
Fixed operating costs per annum excluding direct material	10,00,000	10,00,000
The selling price of the product is ` 1,000 per unit and the only variable cost per unit is direct material, which costs ` 400 per unit. There is demand for all units produced.		

Evaluate each of the following proposals independent of each other:

- (i) An outside agency is willing to do the finishing operation of any number of units between 5,000 and 7,000 at ` 400 per unit.
- (ii) An outside agency is willing to do the cutting operation of 2,000 units at ` 200 per unit.
- (iii) Additional equipment for cutting can be bought for ` 10,00,000 to increase the cutting facility by 50,000 hour, with annual fixed costs increased by ` 2 lacs.

(4 Marks)

Answer

(a) JIT System and overhead costs:

- (i) Reduction in material handling, facilities and quality inspection costs;
- (ii) Reduced inventory reduces storage costs.
- (iii) Costs shift from overhead cost pool to direct costs when machine cells are introduced. A more reliable allocation of costs to products and therefore more accurate analysis for decision making.
- (iv) With the JIT System in place, the general overhead pool can be better allocated due to availability of more information regarding the most appropriate cost drivers.

(b) Benefits of Enterprise Resource Planning:

- It helps in better production planning and optimization in resource use.
- In the case of multi-national, multi-company and multi-site manufacturing and environment, ERP simplifies the procedures by adopting one integrated plan out of the sub-plans.
- It facilitates in optimization of inventory holding and efficient inventory reporting, even in multi location operations.
- It enables the companies to efficiently deliver the right product from right warehouse to right customer at right time i.e. it provides best logistic solutions.
- It enables quick response to changes in business operations and market conditions.
- It helps to achieve competitive edge by improving business process.

PAPER – 5 : COST MANAGMENT

(c)

Product	Phase	Reason
M	Maturity	Competition intensifies and sales increases but at a decreasing rate
N	Growth	New competition but sales remain good.
O	Maturity	Extended product lines with new models.
P	Decline	Sales decreases and less costly substitutes are available.

(d) Step 1 : Conversion to a minimization problem by subtracting each element from the maximum element, 60

A	50	0	30
B	40	30	45
C	0	20	50

Step 2 : Row minimization operation

A	50	0	30
B	10	0	15
C	0	20	50

Step 3 : Column minimization operation

A	50	0	15
B	10	0	0
C	0	20	50

3 lines, 3x3 matrix. The solution is optional

Maximum revenue :

Sales Man à	Assignment	Sales Revenue
A	Y	60
B	Z	15
C	X	60
Total		135

(e)

	Cutting	Finishing
Capacity (units)	10,000	5,000
Selling Price 1000		
Material Cost <u>400</u>		
Throughput contribution 600 Rs./u.		

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(i) Throughput Contribution	600
Subcontracting changes	<u>400</u>
	200

Increase in throughput contribution = $200 \times 5000 = 10,00,000$

- (ii) Already cutting has surplus capacity. It is not a bottleneck. Do not outsource as there will be no benefit, instead there will be reduction of or throughput contribution of outsourced.
- (iii) Cutting has surplus capacity. Do not increase non-bottleneck capacity.

