

PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

Question No.1. is compulsory.

Answer any five questions from the remaining six questions

Question 1

- (a) A company actually sold 8000 units of A and 10,000 units of B at ₹ 12 and ₹ 16 per unit respectively against a budgeted sale of 6000 units of A at ₹ 14 per unit and 9000 units of B at ₹ 13 per unit. The standard costs of A and B are ₹ 8 and ₹ 10 per unit respectively and the corresponding actual costs are ₹ 5.5 and ₹ 14.5 per unit.

Compute the product wise sales margin mix and sales margin price variances, indicating clearly, whether the variances are favorable or adverse. (5 Marks)

- (b) A company makes a single product which sells at ₹ 800 per unit and whose variable cost of production is ₹ 500 per unit. Production and sales are 1000 units per months. Production is running to full capacity and there is market enough to absorb an additional 20% of output each month. (5 Marks)

The company has two options:

Option-I

Inspect finished goods at ₹ 10,000 per month. 4% of production is detected as defectives and scrapped at no value. There will be no warranty replacement, since every defect is detected. A small spare part which wears out due to defective material is required to be replaced at ₹ 2,000 per spare for every 20 units of scrap generated. This repair cost is not included in the manufacturing cost mentioned above.

Option-II

Shift the finished goods inspection at no extra cost, to raw material inspection, (since defective raw materials are entitled to free replacement by the supplier), take up machine set-up tuning and machine inspection at an additional cost of ₹ 8,000 per month, so that scrap of finished goods is completely eliminated. However, delivery of uninspected finished products may result in 1 % of the quantity sold to be replaced under free warranty due to minor variation in dimensions, which does not result in the wearing out of the spare as stated in Option-I

- (i) Using monthly figures relevant for decision making, advise which option is more beneficial to the company from a financial perspective.
- (ii) Identify the quality costs that can be classified as
- (a) appraisal costs and
 - (b) external failure costs.

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- (c) Pick out from each of the following items, costs that can be classified under 'committed fixed costs' or 'discretionary fixed costs'.
- Annual increase of salary and wages of administrative staff by 5% as per agreement
 - New advertisement for existing products is recommended by the Marketing Department for achieving sales quantities that were budgeted for at the beginning of the year.
 - Rents paid for the factory premises for the past 6 months and the rents payable for the next six months. Production is going on in the factory.
 - Research costs on a product that has reached 'maturity' phase in its life cycle and the research costs which may be needed on introducing a cheaper substitute into the market for facing competition.
 - Legal consultancy fees payable for patent rights on anew product Patenting rights have been applied for. (5 Marks)
- (d) The following matrix is a minimization problem for transportation cost. The unit transportation costs are given at the right hand corners of the cells and the D_{ij} values are encircled.

	D1	D2	D3	Supply
F_1	3	4	4	500
F_2	9 8	300 6	7 2	300
F_3	4 0	6 2	5 200	200
Deamnd	300	400	300	1000

Find the optimum solution (s) and the minimum cost.

Answer

(a)

	BQ	RBQ	AQ	AP	<u>BP</u>	<u>BC</u>	<u>BM</u>	<u>AM</u>
A	6000	7200	8000	12	14	8	6	4
B	<u>9000</u> <u>15000</u>	<u>10800</u> <u>18000</u>	10000	16	13	10	3	6

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Sales Margin Mix Variance:

(Actual Qty in Budgeted Mix – Actual Qty in Actual Mix) x Budgeted Margin

A : $(7,200 - 8,000) \times 6 = -4,800$ (Fav)

B : $(10,800 - 10,000) \times 3 = \underline{2,400}$ (Adv)

Total Mix Variance = -2,400 (Fav)

Sales Margin Price Variance = Actual Qty (Budgeted Margin – Actual Margin)

A $8,000 (6 - 4) = 16,000$ (A)

B $10,000 (3 - 6) = \underline{30,000}$ (F)

Total Price Variance 14,000 (F)

(b)

	Option I		Option II	
Production	1000 Units		1000 Units	
Finished Goods Inspection	10,000	Appraisal	-	
Raw Material Inspection scrap 4% = 40 units x variable cost per unit 500	20,000	Appraisal	10,000	
Contribution lost 300 x 40	12,000	Appraisal		
Machine repair	4,000	Appraisal	-	
Machine set up			8,000	
Warranty replacement	-			
1% x 1000 = 10 unit				
Contribution lost 10 x 300			3,000	External failure
Variable Cost lost 10 x 500	_____		<u>5,000</u>	External failure
Quality Cost	<u>46,000</u>		<u>26,000</u>	

Better Option II

(c)

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

- (d) Δ_{ij} values are given for unallocated cells. Hence, no. of allocated cells = 5, which = 3 + 3 - 1 = no. of columns + no of rows - 1.

Allocating in other than Δ_{ij} cells.

Factory	S1	D2	D3	Supply
	3 300	4 100	4 100	500
	9 8	6 300	7 2	300
	4 0	6 2	5 200	200
	300	400	300	1000

This solution is optional since Δ_{ij} are non-ve. For the other optional solution, which exists since $\Delta_{ij} = 0$ at $R_3 C_1$, this cell should be brought in with a loop : $R_3, C_1 - R_1 C_1 - R_1 C_3 - R_3 C_3$.

Working Notes:

- Step I : $R_1 C_1$ (Minimum of 300, 500)
 Step II : $R_2 C_2$ (Minimum of 300, 400)
 Step III : $R_1 C_2$ balance of C_2 total : 100, R_1 Total = 100
 Step IV : $R_1 C_3$ 100 (balance of C_3 total = 200)
 Step V : $R_3 C_3$ 200

Solution I

-100			+100
	300	100	100
		300	
+100	0		200
			-100

Solution II

200	100	200
	300	
100		100

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	Solution I	Solution II
Cost:	3 x 300 = 900	3 x 200 = 600
	4 x 100 = 400	4 x 100 = 400
	4 x 100 = 400	4 x 200 = 800
	6 x 300 = 1800	6 x 300 = 1800
	5 x 200 = 1000	5 x 100 = 500
		4 x 100 = <u>400</u>
Minimum Cost	<u>4500</u>	<u>4500</u>

Question 2

- (a) During the last 20 years, KL Ltd's manufacturing operation has become increasingly automated with computer-controlled robots replacing operators. KL currently manufactures over 100 products of varying levels of design complexity. A single plant wide overhead absorption rate, based on direct labor hours is absorb overhead costs.

In the quarter ended March, KL's manufacturing overhead costs were:

	(₹ 000)
Equipment operation expenses	125
Equipment maintenance expenses	25
Wages paid to technicians	85
Wages paid to component stores staff	35
Wages paid to dispatch staff	40
Total	310

During the quarter, the company reviewed the Cost Accounting System and concluded that absorbing overhead costs to individual products on a labour hour absorption basis was meaningless and that overhead costs should be attributed to products using an Activity Based Costing (ABC) system, The following are identified as the most significant activities.

- Receiving component consignments from suppliers.
- Setting up equipment for production runs
- Quality inspections
- Dispatching goods as per customer's orders.

Equipment operation and maintenance expense are apportioned as :

- Component stores 15% production runs 70% and dispatch 15%

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Technician's wages are apportioned as:

- Equipment maintenance 30% set up equipment for production runs 40% and quality inspections 30%

During the quarter:

- (i) 980 component consignments were received from suppliers.
- (ii) 1020 production runs were set up
- (iii) 640 quality inspections were carried out.
- (iv) 420 orders were dispatched to customers.

KL's production during the quarter included component R. The following information is available:

	Component R
Component Consignments received	45
Production runs	16
Quality Inspections	10
Orders (goods) dispatched	22
Quantity produced	560

Calculate the unit manufacturing overhead cost of component R using ABC system.

(8 Marks)

(b) State any three differences between PERT and CPM

(3 Marks)

(c) What are the disadvantages of Cost Plus Pricing ?

(5 Marks)

Answer

(a)

	Receiving Supplies (Rs.000)	Set ups (Rs. 000)	Quality Inspection (Rs.000)	Despatch (Rs.000)	Total (Rs.'000)
Equipment Operation Expenses	18.75	87.50		18.75	125.00
Maintenance technicians wages initially allocated to maintenance (30% of Rs. 85,000 = Rs. 25,500	3.75	17.50		3.75	25.00
and then reallocated on	3.83	17.85		3.82	25.50

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the same basis on maintenance					
Balance of technician wages, allocated to set ups and quality inspections		34.00	25.50		59.50
Stores wages – Receiving	35.00				35.00
Despatch wages – Despatch				40.00	40.00
	61.33	156.85	25.50	66.32	310.00

Note: Equipment operations expenses and Maintenance allocated on the basis 15%, 70%, and 15% as specified in the question.

The next stage is to identify cost drivers for each activity and established cost driver rates by dividing the activity costs by a measure of cost drive usage for the period. The Calculations are as follows:

Receiving supplies (Rs. 61,330/980) = Rs. 62.58 per component
 Performing set ups (Rs. 1,56,850/1020) = Rs. 153.77 per set up
 Despatching goods (Rs. 66,320/420) = Rs. 157.93 per goods order despatched
 Quality Inspection (Rs. 25,500/640) = Rs. 39.84

Finally the costs are assigned to components based on their cost driver usage. The assignments are as follows:

	(Rs.)
Direct Labour	300.00
Direct Materials	1200.00
Receiving supplies	2816.10
Performing Set Up	2460.32
Quality Inspection	398.40
Despatching goods	<u>3474.46</u>
Total Overhead Costs	<u>10461.54</u>
	(Rs.)
No. of units produced	560
Cost per unit	16.34

For components the overhead costs have been assigned as follows (for components R)

Receiving supplies (45 receipts at Rs. 62.58)

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Performing setups	(16 production runs at Rs. 153.77)
Quality Inspections	(10 at Rs. 39.84)
Despatching goods	(22 at Rs. 157.93)

(b)

PERT	CPM
(i) Non repetitive jobs	Repetitive Jobs
(ii) Probabilistic Model	Deterministic Model
(iii) Event oriented	Activity oriented
(iv) Incorporates statistical analysis	Does not incorporate statistical analysis
(v) Useful as control device	Difficulty to use as control device

(c) Disadvantages of cost plus pricing:

- (i) If ignores demand, fails to take into account buyers' needs and willingness to pay.
- (ii) Fails to reflect competition adequately.
- (iii) Assumes correct cost estimation, whereas in multiproduct firm, costs may be arbitrarily allocated.
- (iv) In many decision, incremental costs are more relevant than full cost. This is ignored.
- (v) Fixed Overheads depends on volume if volume is more cost is less, and vice-versa. Increase decrease in sales volume depends on price. Thus it is a vicious circle – cost plus markup is a price based on sales volume & sales volume is based on price.

Question 3

(a) A manager was asked to assign tasks to operators (one task per operator only) so as to minimize the time taken. He was given the matrix showing the hours taken by the operators for the tasks.

First, he performed the row minimum operation. Secondly, he did the column minimum operation. Then, he realized that there were 4 tasks and 5 operators. At the third step he introduced the dummy row and continued with his fourth step of drawing lines to cover zeros. He drew 2 vertical lines (under operator III and operator IV) and two horizontal lines (aside task T_4 and dummy task T_5) At step 5, he performed the necessary operation with the uncovered element, since the number of lines was less than the order of the matrix. After this, his matrix appeared as follows:

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Tasks	Operators				
	I	II	III	IV	V
T_1	4	2	5	0	0
T_2	6	3	3	0	3
T_3	4	0	0	0	1
T_4	0	0	5	3	0
T_5 (dummy)	0	0	3	3	0

- (i) What was the matrix after step II ? Based on such matrix, ascertain (ii) and (iii) given below.
- (ii) What was the most difficult task for operators I, II and V ?
- (iii) Who was the most efficient operators?
- (iv) If you are not told anything about the manager's errors, which operator would be denied any task? Why?
- (v) Can the manager go ahead with his assignment to correctly arrive at the optimal assignment, or should he start afresh after introducing the dummy task at the beginning? (10 Marks)
- (b) Classify the following measures under appropriate categories in a balanced score card for a banking company which excels in its home loan products:
- (i) A new product related to life insurance is being considered for a tie up with the successful housing loan disbursements.
e.g. every housing loan applicant to be advised to take a life policy or compelled to take a fire insurance policy.
- (ii) How different sectors of housing loans with different interest rates have been sanctioned, their volumes of growth in the past 4 quarters.
- (iii) How many days are taken to service a loan, how many loans have taken longer, what additional loans are to be released soon, e.t.c
- (Students are not required to copy these statements into their answer books) (3 Marks)
- (c) A company can make any one of the 3 products X,Y or Z in a year. It can exercise its option only at the beginning of each year.

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

	X	Y	Z
Selling Price (₹/u)	10	12	12
Variable Costs(₹/u)	6	9	7

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Market Demand (units)	3000	2000	1000
Production capacity (units)	2000	3000	900
Fixed Costs (₹)			30,000

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

Answer

(a)

	01	02	03	04	05
(given)					
T ₁	4	2	5	0	0
T ₂	6	3	3	0	3
T ₃	4	0	0	0	1
T ₄	0	0	5	3	0
T ₅	0	0	3	3	0
(Dummy)					

Junction values at dummy = 3. 3 was the minimum uncovered element.

Previous step was

7	5	5	0	3
9	6	3	0	6
7	3	0	0	4
0	0	2	0	0
0	0	0	0	0

(i) At step II the matrix was:

7	5	5	0	3
9	6	3	0	6
7	3	0	0	4
0	0	2	0	0

(ii) For Operator I, Most difficult task will be indicated by hours = T₂

Operator II

T₂

Operator V

T₂

(iii) Most efficient operator = Operator 4

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(iv) If the Manager's mistake was not known,

4	2	5	0	0
6	3	3	0	3
4	0	0	0	1
0	0	5	3	0
0	0	3	3	0

We continue the assignment; $T_1 - 0_5$,

$T_2 - 0_4$, $T_3 - 0_3$ are fixed.

Between T_4 and T_5 , 0_1 or 0_2 Can be allotted.

So, other 0_1 or 0_2 Can be denied the job.

(v) Yes, the Manager can go ahead with the optimal assignment

Row minimum is not affected by when the dummy was introduced.

Column minimum was affected. But in the process, more zeros were generated to provide better solution.

- (b) (i) New product tie up - Innovation/learning perspective
(ii) Growth of Volume - Financial perspective
(iii) Time for loan/Fresh products - Customer perspective

(c)

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

(Note: Opportunity cost is maximum benefit for gone.

Question 4

Answer any four out of the following five subdivisions:

- (a) 6000 pen drives of 2 GB to be sold in a perfectly competitive market to earn ₹1,06,000 profit, whereas in a monopoly market only 1200 units are required to be sold to earn the same profit. The fixed costs for the period are ₹ 74,000 . the contribution per unit in the monopoly market is as high as three fourths its variable cost. Determine the targets selling price per unit under each market condition.
- (b) In a company, factory, overheads are applied on the basis of direct labour hours.

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The following information is given:

	Department	
	A	B
Fixed factory overheads(₹)	3,36,000	1,26,000
Variable labour hours (₹ per hour) required as per direct labour hour budget	0.50	1.50
For product X	1,40,000	70,000
For product Y	28,000	56,000

- (c) Classify the following items under the three measures used in the theory of constraints:
- (i) Research and Development Cost
 - (ii) Rent/Utilities
 - (iii) Raw materials used for production
 - (iv) Depreciation
 - (v) Labour Cost
 - (vi) Stock of raw materials
 - (vii) Sales
 - (viii) Cost of equipments and buildings.
- (d) Will the initial solution for a minimization problem obtained by Vogel's Approximation Method and the Least Cost Method be the same ? Why?
- (c) Name any four stage in the process of bench marking. (4 x 4 = 16 Marks)

Answer

(a)

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

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(b)

	Products	
	X	Y
Variable Overheads	175000	98000
Fixed Overheads	<u>350000</u>	<u>112000</u>
Total	<u>525000</u>	<u>210000</u>

Working Note:

	Department A	Department B
Variable Overheads		
Product X	70,000	1,05,000
Product Y	14,000	84,000
Fixed Overheads		
Product X	2,80,000	70,000
Product Y	56,000	56,000

(c) The 3 key measures are :

Contribution	(iii) Raw Material for production
	(vii) Sales
Operating Costs	(ii) Rent/utilities (iv) Depreciation
	(v) Labour
Investments:	(i) R& D (vi) Raw Material Stock
	(viii) Building and Equipment Cost

(d) The initial solution need not be the same under both methods.

Vogel's Approximation Method uses the differences between the minimum and the next minimum costs for each row and column.

This is the penalty or opportunity cost of not utilising the next best alternative. The highest penalty is given the 1st preference. This need not be the lowest cost.

For example if a row has minimum cost as 3, and the next minimum as 2, penalty is 1; whereas if another row has minimum 4 and next minimum 6, penalty is 2, and this row is given preference. But least cost given preference to the lowest cost cell, irrespective of the next cost.

Vogel's Approximation Method will to result in a more optimal solution than least cost.

They will be the same only when the maximum penalty and the minimum cost coincide.

(e) Various stages in the process of benchmarking.

- I Planning
 - Determination of benchmarking goal statement
 - Identification of best performance
 - Establishment of the benchmarking or process improvement team
 - Defining the relevant benchmarking measures
- II Collection of data and information
- III Analysis of finding based on data collected
- IV Formulation and implementation of recommendation
- V Constant Monitoring and reviewing.

Question 5

(a) A Company has two manufacturing divisions X and Y, X has a capacity of 96000 hours per annum. It manufactures two products. 'Gear' and 'Engines' as per the following details.

	Gears	Engines
Direct Materials	240	64
Variable costs at ` 64/hour	256	64
Selling price in the outside market	640	128

Division 'Y' produces product 'Wheels' as per the following details:

	₹/unit
Imported components	640
Direct Materials	96
Variable cost at ` 40 per hour	320
Selling price in the outside market	1,160

The fixed overheads for X and Y are ₹ 24 lakhs and ₹ lakhs respectively. With a view to minimizing dependence on the imported component, the company has explored a possibility of Division Y using product 'Gears' instead of the imported component. This is possible provided Division Y spends 2 machine hours entailing an additional expenditure of ₹ 64 per component on modification of product 'Gears' to fit into 'wheels'. Production and sales of 'Wheels' in Division Y is limited to 5000 units per annum.

- (i) What will be maximum transfer price per unit that Y will offer ?
- (ii) In each of the following independent situations, state with supporting calculations, the minimum transfer price per unit that X will demand from Y, if 5000 units are required by Y.

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- (iii) In which of the above situations in (ii) will the Management step in and compel X to sell to Y in the interest of overall company's profits ? (11 Marks)
- (b) A company manufactures two products X and Y involving three departments, Machining, Fabrication and Assembly which have limitations on the hours as 720 hours, 1800 hours and 900 hours respectively. X and Y require 1 and 2 hour of machining time per unit and 3 hours and 1 hours of assembly time per unit respectively. X and Y fetch ₹ 80 and ₹ 100 as respective unit contributions.
- (i) Write the linear program to maximize contribution
- (ii) Introducing appropriate variables, restate the problem as linear equations fit to be incorporated in the simplex tableau.

Answer

- (a) Y will pay only a maximum of Rs. (640-64) = Rs. 576 so that its outside purchase cost is matched. i.e Maximum Transfer price by Y = 576 Rs. per unit.

	Gears (no. of units)	Engines
Market demand is limited to	20,000	20,000
Market demand is limited to	15,000	10,000
Market demand is limited to	18,000	24,000

	Gears	Engines	Total
Hours per unit	4	1	
Hours available			96,000
Units possible	24,000		
	or	96,000	
(ii) (a) Outside Demand	20,000	20,000	
Hours required	80,000	20,000	
Units required by Y	5,000		
Hours required	20,000		
Contribution per hour	36	30	
Maximise Sales so that hours=	80,000	16,000	
Hours used for Y	4,000	16,000	
Contribution per units of Y required	1,000	4,000	
On units transferred to Y	30 x 16,000 + 36 x 4000 = 480,000 + 1,44,000		

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$$\begin{aligned} &= 6,24,000 \\ \text{Contribution per units} &= 6,24,000/5,000 = 124.80 \end{aligned}$$

$$\begin{aligned} \text{Minimum Transfer price per unit} &= \text{Contribution} + \text{variable cost} \\ &= 124.8 + 240 + 256 \\ &= \text{Rs. } 620.80 \end{aligned}$$

(b)	Gears	Eng.
Market Demand	15,000	10,000
Hours required per unit	4	1
Hours required	60,000	10,000
Spare capacity available =		26,000
Units of Gears possible = 26,000 per unit =		6,500
Required For transfer	=	5,000
Since spare capacity is used, minimum transfer		
Price = variable cost of manufacturing = 240 + 256		
= 496		

X will agree to anything above Rs. 496 per unit

(c)	Market Demand		
Units	18,000	24,000	
Hours per units	4	1	
Hours required	72,000	24,000	
Hours required for Y's demand		20,000	
This will be need by sacrificing production of 'Engines'. Hence contribution per hours for transferred Units must be atleast.			
Contribution Required on 5000 units = 20,000 x 30 = 6,00,000			
Contribution Required per unit = $\frac{6,00,000}{5,000} = 120 \text{ Rs.}$			
Minimum Transfer Price = Contribution per unit + Variable Cost			
= 120 + 240 + 256			
= Rs. 616 per unit			

Gears and Engines earn a contribution.

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Variable Cost of in house manufacturing of imported Components = 240 + 256 + 64
= 560

Production Outside = Rs. 640

Rs. 80/- per unit is being paid for outside purchase

Contribution Lost per unit of facility X = $\frac{80}{4} = 20$ hrs.

Since X is earning higher contribution per hours 36 & 30 for each product, the management will not have to interfere in situation (a) & (c) where full production capacity is used for outside sales.

In (i) (b) Management need not interfere since it is a win-win situation. Departments can negotiate in the relevant range between 496 and 576.

- (b) Maximize $Z = 80X + 100Y$ subject to
- $$\begin{aligned} x + 2Y &\leq 720 \\ 5x + 4y &\leq 1800 \\ 3x + y &\leq 900 \\ x \geq 0; y \geq 0 \end{aligned}$$

Where x is the number of units of A and y is the number of units of B

By the addition of slack variables, S1 S2 S3 the inequality can be converted to the equations. The problem thus becomes

$$\begin{aligned} Z = 80X + 100Y \text{ subject to} \quad & x + 2y + S1 = 720 \\ & 5x + 4y + S2 = 1800 \\ & 3x + y + S3 = 900 \end{aligned}$$

$$x \geq 0; y \geq 0 \quad S1 \geq 0; S2 \geq 0; S3 \geq 0.$$

Question 6

- (a) Explain the pre-requisites for successful operation of material requirement planning. (5 Marks)
- (b) Point out the errors in the network given below, going by the usual conventions while drawing a network to use CPM (6 Marks)
- (c) Maruthi Agencies has received an order from a valuable client for supplying 3,00,000 pieces of a component at ₹ 550 per unit at a uniform rate of 25000 units a month.

Variable manufacturing costs amount to ₹ 404.70 per unit, of which direct materials is ₹ 355 per unit. Fixed production overheads amount to ₹ 30 lacs per annum, including depreciation. There is a penalty/reward clause of ₹ 30 per unit for supplying less/more than 25000 units per month. To adhere to the schedule of supply, the company procured

a machine worth ₹ 14.20 lacs which will wear out by the end of the year and will fetch ₹ 3.55 lakh at the year end. After this supply of machine, the supplier offers another advanced machine which will cost ₹ 10.65 lakhs, will wear out by the year end and not have any resale value. If the advanced machine is purchased immediately, the purchaser will exchange the earlier machine supplied at the price of the new machine. Fixed costs of maintaining the advanced machine will increase by ₹ 14,200/- per month for the whole year. While the old machine had the capacity to complete the production in 1 year, the new machine can complete the entire job in 10 months. The new machine will have material wastage of 0.5%. Assume uniform production throughout the year for both the machines.

Using incremental cost/revenue approach, decide whether the company should opt for the advanced version.

Answer

(a) Pre-requisites for successful operation of MRP system are:

- (i) The latest production and purchasing schedules prepared should be strictly adhered to. Day to Day change from predetermined schedules will cause chaos.
- (ii) Raw Materials, sub-assemblies and components required for production should be pre-determined in quantifiable terms. Standard should be set for the consumption quantity, quality, mix and yield of raw materials for every unit of finished product.
- (iii) Work-force must be appraised of the system and the need for absolute adherence to the schedules prepared.
- (iv) Necessary internal control system should be developed to ensure total adherence to the schedule.
- (v) Accuracy of the data supplied is vital to the MRP system.

(b) Flows

- 2 – 3 : There are 2 activities which are duplicate. In case they are two different activities, one may pass through a dummy
- 2 – 5 is a dangling activity; No complete path exists.
Can be joined to (9) with a dummy
- 4 – 6 & 6 – 4 : looping exists; This is not proper sequencing

(c)

	Old (Rs.)	New (Rs.)	Incremental
Depreciation			-
Rs.14.2 lakhs – Rs. 3.55 lakhs	10,65,000	10,65,000	

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

Decision: Buy the advanced version.

Working Note:

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

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

advance supply per month = 5,000

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

Question 7

- (a) A car rental agency has collected the following data on the demand for five-seater vehicles over the past 50 days.

Daily Demand	4	5	6	7	8
No. of Days	4	10	16	14	6

The agency has only 6 cars currently.

- (i) Use the following 5 random numbers to generate 5 days of demand for the rental agency
Random Nos 15,48,71,56,90
- (ii) What is the average number of cars rented per day for the 5 days ?
- (iii) How many rentals will be lost over the 5 days? (5 Marks)
- (b) Entertain U Ltd. hires an air-conditioned theatre to stage plays on weekend evenings. One play is staged per evening. The following are the seating arrangements:
VIP rows-the first 3 rows of 30 seats per row, priced at ₹ 320 per seat.
Middle level-the next 18 rows of 20 seats per row priced at ₹ 250 per seat.

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

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

- (i) You are required to calculate the number of seats that Entertain U has to sell in order to break-even and give the categorywise total seat occupancy at BEP.
- (ii) Instead of the given pattern of demand, if Entertain U finds that the demand for VIP, Middle and Last level is in the ratio 2:2:5, how many seats each category will Entertain U have to sell in order to break-even.?

Answer

(a)

Daily demand	Days	Probability	Cumulative probability	Random No.	Day	Demand	Rented	Rental lost
4	4	0.08	0.08	00-07	1	5	5	
5	10	0.20	0.28	08-27	2	6	6	
6	16	0.32	0.60	28-59	3	7	6	1
7	14	0.28	0.88	60-87	4	6	6	
8	<u>6</u>	<u>0.12</u>	1.00	88-99	5	8	<u>6</u>	<u>2</u>
	50	1.00					<u>29</u>	<u>3</u>

$$\text{Average no. of cars rented} = \frac{29}{5} = 5.8$$

Rental lost = 3

(b) Fixed Costs

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

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

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

(1 Mark)

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

	VIP Rows	Middle Level	Last Level	
BF Seats Total 150	30	90	30	
Contribution per unit	300	200	100	

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Contribution (Rs.)	<u>9,000</u>	<u>18,000</u>	<u>3,000</u>	30,000 Rs.

Category wise occupancy at Break Even Point

VIP 30+30+30 = 90

Middle = 90+180 = 270

Last = 120

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

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

$$= \frac{600 + 400 + 500}{9} = \frac{1500}{9}$$

$$= \frac{30,000}{1,500} \times 9 = 180 \text{ seats}$$

Ratio	40	40	100	
Quantity available	30	180	90	
Break Even quantity	30	10	90	
		10	10	
	30	60	90	

Contribution per unit	300	200	100	
No. of seats	30	60	90	
Contribution Rs.	<u>9,000</u>	<u>12,000</u>	<u>9,000</u>	
	Total = 30,000			

(b) Alternative approach of solution:

	Rs
Net fixed cost to be recovered by EU (As worked earlier pages)	30,000

(i) When demand in ration 1:3:1

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	VIP Seats	Mid Level	Last Level	Total
Seats Available to EU (Max) (no)	30	180	90	300
Net contribution per seat (Rs)	300	200	100	
Contribution based on demand pattern (Rs)	300	600	100	1000
BEP Seats in std. demand ratio (no)	30	90	30	150
Contb. on BEP seats (verification) (Rs.)	9000	18000	3000	30,000

Weighted avg. contribution per seat as per std.

$$\text{demand pattern } \frac{1000}{5} = \text{Rs.200}$$

$$\text{No of seats for BEP} = \frac{\text{NetFixedCost}}{\text{Av.Contribution}} = \frac{\text{Rs.30000}}{\text{Rs.200}} = 150 \text{ seats}$$

(ii) When demand in ratio 2:2:5

	VIP	Mid Level	Last Level	Total
Seats Available to Eu (Max) (no)	30	180	90	300
Net Contribution per seat (Rs)	300	200	100	
Contribution based on demand pattern (Rs.)	600	400	500	1500
BEP Seats in std. demand ratio (nos)	40	40	100	180
Seats adjusted to level (nos)	(--)10	20	(---)10	

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BEP seats adjusted) (nos)	30	60	90	180
Contb. amount (Rs)	9000	12000	9000	30,000

Weighted average contribution per seat as per

demand pattern $\frac{1500}{9} = \text{Rs. } 166.66$

No. of Seats for BEP = $\frac{\text{Rs. } 30,000}{\text{Rs. } 166.67} = 150 \text{ seats}$