PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

*Question No.**1** is compulsory.*

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

Working notes should form part of the answer.

No statistical or other table will be provided with this question paper.

Wherever necessary, candidates may make appropriate assumptions and clearly state them.

Question 1

(a) A company manufactures three components, A, B and C. these components pass through machines P and Q. The machine hour capacity of Q is limited to 7,800 hours a month. The company is interested in fulfilling the market demand to retain its market share. The following information is given:

		A	B	C
Demand (units/ month)		1,200	1,200	1,500
Variable cost (₹/ unit)		187	215	111
Fixed cost (₹/ unit) (at normal capacity utilization)		115	115	55
Hours per unit	P	2	2	1½
	Q	3	3	1

Component B has to be made by the company. There is a supplier available for components A and C at ₹ 280 and ₹ 161 per unit respectively.

(i) Which component(s) and in what quantities should be purchased to minimize costs?

(ii) From a financial perspective, what do you need to ensure in order to justify your answer in (i) above? (5 Marks)

(b) The following independent situations relate to new product pricing. Classify the products into the appropriate category: Revolutionary Product (RP), or Evolutionary Product (EP) or a Me-Too Product (MP) and state the corresponding pricing to be followed:

Sl. No.	Situation	RP/EP/MP	Pricing
I	II	III	IV
(i)	Adjustable work table like a stool, has been successfully capturing the market. Company X makes a small variant of this product and is trying to enter the market.		
(ii)	R & D has just been completed on an innovative computer processor in the shape of a pen, with accompanying pen-like devices to act as keyboard projector and monitor projector. This is expected to get		

	the laptops out of business due to extreme ease of portability of just 3 pen-like light weight devices.		
(iii)	*A successful mobile manufacturing company has built into its latest mobile phone, an additional sliding screen and improved its processor capabilities so that the phone is almost a laptop.*		

You may present only columns I, III & IV. You are required to explain the pricing in one sentence. *(5 Marks)*

(c) *XY Ltd. manufactures two types of mobile phones, X and Y. Due to severe competition, it has to reduce the prices for the next production period. The following information is provided:*

	X	***Y***
Current Period:		
Selling price (₹/ unit)	*10,000*	*12,000*
P/V ratio	*25%*	*30%*
Product-specific fixed cost (₹)	*10,00,000*	*15,00,000*
Next Period:		
Selling price (₹/unit)	*8,000*	*9,000*

For the next period the company wants the present P/V ratio to be maintained and achieve a break-even for both the products at 400 units.

What is the cost reduction programme envisaged? *(5 Marks)*

(d) *The following 3 × 3 matrix arises after the Row minimum and Column minimum operation of a minimization assignment problem:*

Columns / ***Rows***	C_1	C_2	C_3
R_1	*0*	*0*	*0*
R_2	*0*	*a*	*b*
R_3	*0*	*c*	*d*

Given that $a \neq b \neq c \neq d \neq 0$, (i.e. a, b, c, d are non zero and unequal), will R_1 C_1 (cell at the intersection of Row 1 and Column 1) appear in the final solution under the assignment algorithm? Why? Interpret this part of the algorithm. *(5 Marks)*

Answer

(a) (i) Statement Showing "Ranking for Manufacturing"

	A (₹)	B (₹)	C (₹)
Demand	1,200	1,200	1,500
Buy Price	280	×××	161
Less: Variable Cost	187	215	111
Saving in Cost *per unit*	93	×××	50
Hrs. Required -"Q"	3	3	1
Saving in Cost *per machine hour*	31	×××	50
Ranking	III	I	II

Statement Showing "Optimum Production Plan"

Product	Units	Machine Hrs./ Unit	Machine Hrs. Required	Balance Hrs.
B	1,200	3	3,600	4,200
C	1,500	1	1,500	2,700
A (Balance)	900*	3	2,700	---

* $\left(\frac{2,700\,\text{hrs.}}{3\text{hrs.}}\right)$

Balance quantity of A, 300 units to be purchased from outside.

(ii) Statement Showing "Conditions for Justification (i)"

	Product A	Product C
Buy Price	< 337 *Or*	> 142
Variable Cost	> 130 *Or*	< 130

(b) New Product Pricing

(i)	Me-too Product (MP)	**Market Price** that is determined by competitive forces for the successful product.
(ii)	Revolutionary Product (RP)	**Premium Pricing**, It can expect to make a tidy profit as a reward for innovation and taking its first initiative.
(iii)	Evolutionary Product (EP)	**Demand Based Pricing**, Price higher than the earlier version to justify its Costs and Benefits subject to what amount can be stepped up in the market.

(c) Statement Showing "Cost Reduction Programme"

		X (₹)	**Y** (₹)
(i)	Current Period Selling Price *per unit*	10,000	12,000
(ii)	Variable Cost for X (75%) & Y (70%) of (i)	7,500	8,400
(iii)	Next Period Selling Price *per unit*	8,000	9,000
(iv)	Variable Cost for X (75%) & Y (70%) of (iii)	6,000	6,300
(v)	Cost Reduction in Variable Cost *per unit* (ii)- (iv)	1,500	2,100
(vi)	Next Period Contribution *per unit* (iii)- (iv)	2,000	2,700
(vii)	Desired BEP *in units*	400 units	400 units
(viii)	Fixed Cost for next period (vi × vii)	8,00,000	10,80,000
(ix)	Current Period's Fixed Cost	10,00,000	15,00,000
(x)	Cost Reduction in Fixed Cost	**2,00,000**	**4,20,000**

(d) R_1C_1 appears at the intersection of R_1 and C_1. Hence, it will have its zero replaced by minimum of a, b, c, or d in the next operation since the number of lines to cover zeros is less than 3.

In the next step, a or b or c or d will have one zero. Then, number of lines will be 3, the order of the matrix. Assignments will be made to the Zeros. Hence, R_1C_1 cannot figure in this.

Interpretation

An assignment of R_1C_1 will eliminate the use of other costs available on R_1 and C_1 entirely. The left over will be a, b, c, or d combinations which are more than zero. Hence, R_1C_1 taking on assignment will be non-optimal.

Question 2

(a) ABC Ltd. produces a gadget made up of special steel plates. The company gets an order for supply of 50,000 gadgets at a price of ₹ 680 per unit.

The gadgets are made of two halves (upper part and lower part) and then welded together.

The cost structure is:

Materials 15 kg. per half @ ₹ 10 per kg; Labour ₹ 60 per half.

Welding charges and fitting charges would be ₹ 20 per gadget.

The special steel plates are in short supply and ABC Ltd. has stock of only 750 Tons. A supplier has only the lower part and has offered to supply 50,000 numbers. Transportation and handling will cost ₹ 6 per half. (consider 1 ton = 1,000 kg)

ABC Ltd. could either execute its order to the extent of material available, or could fulfil the entire order by buying the lower part from the supplier. Evaluate both the options and find out the maximum price that ABC would be willing to pay the supplier per lower part if.

(i) it wants to retain the same level of profit per unit as in own manufacture.

(ii) if any additional revenue is preferred.

Present your calculations to the nearest rupee. *(6 Marks)*

(b) The following information on activities, the Earliest Start Time (EST), Latest Start Time (LST), Earliest Finish Time (EFT) in days is given for a certain project:

Activity	EST	LST	EFT	Crashing Cost ₹ / day
A	0	0	5	1,000
B	0	6	6	2,000
C	5	8	9	3,000
D	5	7	8	4,000
E	5	5	6	5,000
F	6	6	10	6,000
G	10	10	24	7,000
H	9	12	21	8,000
I	24	24	26	9,000

Given that: G is immediately preceded by F and D.

B's successor is H and H's successor is I. It is not possible to have a zero duration activity.

(i) What is the project completion time?

(ii) Find the LFT (Latest Finish Times) of activities C, D, H and B.

(iii) Reduce the project duration by three days, by performing step by step crashing to minimize crashing cost assuming that no activity can be crashed by more than one day.

(iv) After the crashing exercise, if activity H's duration is increased by one day, by how many days can you increase the duration of each of the activities B and C without delaying the project beyond its crashed duration? Explain the underlying concept.

(You are not expected to present the network diagram).

(You may opt the following format for your answer).

Sl. No.

(i) Duration = _____

(ii) LFT:

C : _____

D : _____

H : _____

B : _____

(iii) Step	*Crash Activity*	*Days*	*Cost (₹)*
I			
II			
III			

(iv) Activity *Increase duration by (days)*

B _____

C _____

Concept

(10 Marks)

Answer

(a) **ABC Ltd.**

Cost Sheet of Gadget

	₹	₹
Upper part:		210
Material (15kg. × ₹10)	150	
Labour	60	
Lower part:		210
Material (15kg. × ₹10)	150	
Labour	60	
Add: Welding Charges		20
Total Cost of Manufacturing		440
Add: Profit		240
Sales Price		680

(i) If ABC wants to retain the same level of profit ***per unit*** as in own manufacture, it has to achieve manufacturing cost of ₹ 440.

	₹
Target Cost	440
Less: Cost of upper part	210
Less: Transportation Cost	6
Less: Welding Charges	20
Price of Lower Part	204

ABC will pay **₹ 204 per lower part** to the supplier for retaining the same level of profit *per unit*.

(ii) Present Capacity Revenue is ₹ 60,00,000/- (25,000 units × ₹ 240)

If Supplier is used, 50,000 units of Gadgets can be sold.

For, **Additional Revenue**

Let Price for Lower Part *per unit*- 'K'

50,000 units × {₹ 680 – (₹ K + ₹ 236*) > ₹ 60,00,000

50,000 units × {₹ 444 – ₹ K) > ₹ 60,00,000

K < 324

(*) Cost of Upper Part *plus* Transportation Cost *plus* Welding Charges

An amount **less than ₹ 324** will be paid for the lower part.

(b) Workings

Activity	Duration	EST	EFT	LST	LFT	Total Float
	D_{ij}	E_i	E_i+D_{ij}	L_j-D_{ij}	L_j	LST−EST
A	5	0	**5**	0	**5**	**0**
B	6	0	6	6	12	6
C	4	5	9	8	12	3
D	3	5	8	7	10	2
E	1	5	**6**	5	**6**	**0**
F	4	6	**10**	6	**10**	**0**
G	14	10	**24**	10	**24**	**0**
H	12	9	21	12	24	3
I	2	24	**26**	24	**26**	**0**

(i) The critical path is the series of activities within the network with *zero total float*. Accordingly, Critical Path is A–E–F–G–I with duration of 26 Days.

(ii) Project Crashing:

Step1: Crash Activity A by 1 Day; Crashing Cost ₹ 1,000/-

Step2: Crash Activity F by 1 Day; Crashing Cost ₹ 6,000/-

Step3: Crash Activity G by 1 Day; Crashing Cost ₹ 7,000/-

Activity E can not be crashed since ZERO duration is not possible.

Requirement of Question

Sl. No.				
(i)	Duration=		26 Days	
(ii)	LFT:			
		C:	12	
		D:	10	
		H:	24	
		B:	12	
(iii)	Step	Crash Activity	Days	Cost (₹)
	I	A	1	1,000/-
	II	F	1	6,000/-
	III	G	1	7,000/-
(iv)	Activity		Increase duration by (days)	
	B		2 Days	
	C		0 Days	

Concept B had a total float of 6 days. Due to 3 days crashing, float reduces by 3. Since B is succeeded by H, and duration of H is increased by 1, the dependent 1 float is to be reduced. Hence, float reduces by 4 days. Therefore, duration of B can be prolonged by 2 days.

C had an original float of 3. It gained one more day due to crashing of A. It could start one day earlier. However, since it is succeeded by H, which had lost its 3 floats and increased 1 day duration, all the 4 days' float of C were consumed. Hence, no further increase in duration.

Question 3

(a) PAL Limited is considering manufacture and launch of 1,000 units of a special product 'L X 4' into the market.

The Direct labour Rate budgeted is ₹ 96 per hour.

Direct labour costs are expected to reduce as the volume of output increase due to the effects of 80% learning curve (index is -0.3219). The expected time to be taken for the first unit is 40 hours and the learning effect is expected to end after 250 units have been produced. The units produced after the first 250 units will take the same time as the 250th unit.

(i) Calculate the standard labour hours expected over the 1,000 units.

(ii) If the actual hours were 6,000, compute the labour efficiency variance over the 1,000 units.

(iii) Without the learning curve application, how would you have reported the efficiency variance, taking the standard time per unit as the expected time for the first unit?

[Note: $250^{-0.3219} = 0.1691$; $249^{-0.3219}=0.1693$] *(6 Marks)*

(b) The following matrix is a transportation cost matrix giving unit costs from Factories F_1, F_2 and F_3 to Destinations D_1, D_2 and D_3:

Factory / Destination	F_1	F_2	F_3	Demand
D_1	3	6	7	60
D_2	8	5	7	30
D_3	4	9	11	30
Supply	35	55	30	

$u_1=0$

(i) Find the initial solution by the Least Cost Method.

(ii) Is the solution non-degenerate? Can you expect a degenerate solution in such a situation? Why?

(iii) Compute the Δ_{ij} matrix by taking $u_1 = 0$ as shown.

(iv) If you considered $u_1=5$ and did the $u_i + v_j$ matrix, would the Δ_{ij} matrix be different form the one you have computed in (iii) above? Why? (You are expected to show the revised computation.)

(v) Find the initial solution by the North West Corner Rule. *(10 Marks)*

Answer

(a) (i) The usual learning curve model is

$$y = ax^b$$

Where

y = Average time per unit for x units

a = Time required for first unit

x = Cumulative number of units produced

b = Learning coefficient

Time required for first 250 units:

$y = 40 \times (250)^{-0.3219}$

$y = 40 \times 0.1691$

$y = 6.764$ hrs.

Total time for 250 units

= 250 units × 6.764 hrs.

= 1,691 hrs.

Time required for first 249 units:

$y = 40 \times (249)^{-0.3219}$

$y = 40 \times 0.1693$

$y = 6.772$ hrs.

Total time for 249 units

= 249 units × 6.772 hrs.

= 1,686.228 hrs.

Time required for 1,000 units:

Total time for first 250 units = 1,691 hrs.

Total time for next 750 units = (1,691 – 1,686.228) hrs. × 750 units

= 3,579 hrs.

Total time for 1,000 units = 1,691 hrs. + 3,579 hrs.

= 5,270 hrs.

(ii) Labour Efficiency Variance = (Std. Hrs. – Actual Hrs.) × Std. Rate

= (5,270 hrs. – 6,000 hrs.) × ₹ 96

= 70,080 (A)

(iii) Labour Efficiency Variance = (Std. Hrs. – Actual Hrs.) × Std. Rate

= (40 hrs. × 1,000 units – 6,000 hrs.) × ₹ 96

= 32,64,000 (F)

(b) (i) Initial Solution by the **Least Cost Method**

	F_1	F_2	F_3	Demand
D_1	3 [35]	6 [25]	7	60/25/0
D_2	8	5 [30]	7	30/0
D_3	4	9	11 [30]	30/0
Supply	35/0	55/25/0	30/0	120

(ii) This solution is degenerate because number of occupied cells (=4) are *less than* required number (=3+3-1)

Degeneracy is certain when in any allocation (earlier than the last allocation), the row and column totals get simultaneously fulfilled.

In this problem, degeneracy arises as allocation at cell D_1F_2, *simultaneously vacates* the row and column totals.

(iii) Since the number of allocation's in the initial feasible solution are 4 and for applying optimality test they should be equal to 5 (m+n-1), therefore we enter a very small assignment equal to *'e'* in the minimum cost cell (D_3F_1) so that no loop is formed.

($u_i + v_j$) Matrix for Allocated / Unallocated Cells

				u_i
	3	6	10	0
	2	5	9	-1
	4	7	11	1
v_j	3	6	10	

Now we calculate $\Delta_{ij} = C_{ij} - (u_i + v_j)$ for non- basic cells which are given in the table below:

Δ_{ij} Matrix

		-3
6		-2
	2	

(iv) If we consider u_1= 5 instead of u_1= 0 for $u_i + v_j$ matrix, Δ_{ij} matrix would remain **same**. Since for each *occupied cell* in the table, the row value (u_i) and column value (v_j) equals the cost element C_{ij}.

(v) Initial Solution by the **North- West Corner Rule**

	F_1	F_2	F_3	Demand
D_1	3 [35]	6 [25]	7	60/25/0
D_2	8	5 [30]	7	30/0
D_3	4	9	11 [30]	30/0
Supply	35/0	55/30/0	30/0	120

Question 4

(a) A Tea company manufacturers two brands of tea namely Super and Normal by blending of four grades of tea leaves as raw material in the following proportion:

Raw Material	***Product Super***	***Product Normal***
Grade A	*70%*	-
Grade B	*30%*	-
Grade C	-	*40%*
Grade D	-	*60%*

During the month of May 2017. It is expected that 200 tons of brand Super and 80 tons of brand Normal will be sold. Actual and budgeted inventories for the month of May 2017 are as follows:

	Actual inventories on 1st May, quantity in Tons	***Budgeted inventories on 31st May, quantity in Tons***
Grade A	*40*	*50*
Grade B	*25*	*56*
Grade C	*150*	*250.90*
Grade D	*60*	*40.50*
Product Super	*40*	*20*
Product Normal	*20*	*15*

Purchased tea leaves are seasoned and then held in stock or issued for production. During seasoning, they lost 15% of their initial weight. Calculate the following:

(i) The Production Budget for the month of May 2017 (in quantity)

(ii) the Raw Material Purchase Budget for May 2017 (in quantity) (8 Marks)

(b) The following data pertains to a company which uses standard marginal costing for manufacture and sale of a single product during the year.

Particulars	*Budget*	*Actual*
Sales (in units)	*60,000*	*66,000*
Sales (₹)	*1,80,00,000*	*2,14,50,000*
Direct Materials (₹)	*28,80,000*	*36,30,000*
Direct Labour (₹)	*43,20,000*	*52,80,000*
Variable Overheads (₹)	*72,00,000*	*81,84,000*
Total Variable Costs	*1,44,00,000*	*1,70,94,000*

Additional information is as follows:

	Standard	*Actual*
Direct material price per kg	*₹12*	*₹ 11*
Direct labour rate per hour	*₹ 9*	*₹ 10*

Calculate the following variance for the year and indicate the type of variance favourable (F), unfavourable (U) or adverse (A).

(i) Direct material usage variance

(ii) Direct material price variance

(iii) Direct labour efficiency variance

(iv) Direct labour rate variance

(v) Variable overhead cost variance

(vi) Sales margin volume variance (8 Marks)

Answer

(a) (i) Production Budget May'17 (tons)

Particulars	Super	Normal
Expected Sales	200	80
Add: Budgeted Inventory (31st May)	20	15
Total Requirements	220	95

Less: Actual Inventory (1st May)	40	20
Required Production	180	75

(ii) Materials Purchase Budget May'17 (tons)

Particulars	Grade A	Grade B	Grade C	Grade D
Requirement for Production	126.00 (180 × 70%)	54.00 (180 × 30%)	30.00 (75 × 40%)	45.00 (75 × 60%)
Add: Budgeted Inventory (31st May)	50.00	56.00	250.90	40.50
Total Requirements	176.00	110.00	280.90	85.50
Less: Actual Inventory (1st May)	40.00	25.00	150.00	60.00
Quantity *to be purchased*	136.00	85.00	130.90	25.50
Add: Lose of Weight* (Seasoning)	24.00	15.00	23.10	4.50
Quantity *to be purchased* (Gross)	160.00	100.00	154.00	30.00

(*) Quantity *to be purchased* × 15% / 85%

(b) (i) Direct Material Usage Variance

= Standard Cost of Standard Quantity for Actual Production – Standard Cost of Actual Quantity

$$= \left(\frac{₹\,28,80,000}{60,000\,\text{units}} \times 66,000\,\text{units}\right) - \left(\frac{₹\,36,30,000}{₹\,11} \times ₹\,12\right)$$

= ₹ 31,68,000 – ₹ 39,60,000

= ₹ 7,92,000 (A)

(ii) Direct Material Price Variance

= Standard Cost of Actual Quantity – Actual Cost

= ₹ 39,60,000 – ₹ 36,30,000

= ₹ 3,30,000 (F)

(iii) Direct Labour Efficiency Variance

= Standard Cost of Standard Time for Actual Production – Standard Cost of Actual Time

$$= \left(\frac{₹\ 43,20,000}{60,000\ \text{units}} \times 66,000\ \text{units}\right) - \left(\frac{₹\ 52,80,000}{₹\ 10} \times ₹\ 9\right)$$

= ₹ 47,52,000 – ₹ 47,52,000

= NIL

(iv) Direct Labour Rate Variance

= Standard Cost of Actual Time – Actual Cost

= ₹ 47,52,000 – ₹ 52,80,000

= ₹ 5,28,000 (A)

(v) Variable Overhead Cost Variance

= Standard Variable Overheads for Production – Actual Variable Overheads

$$= \left(\frac{₹\ 72,00,000}{60,000\ \text{units}} \times 66,000\ \text{units}\right) - ₹\ 81,84,000$$

= ₹ 2,64,000 (A)

(vi) Sales Margin Volume Variance

= Standard Margin – Budgeted Margin*

$$= \left(\frac{₹\ 36,00,000}{60,000\ \text{units}} \times 66,000\ \text{units}\right) - ₹\ 36,00,000$$

= ₹ 3,60,000 (F)

(*) Budgeted Margin

= ₹ 1,80,00,000 – ₹ 1,44,00,000

= ₹ 36,00,000

Question 5

(a) A company can make any or both of products A and B in a production period not exceeding a total of 10,000 units due to non-availability of the required material and labour. Until now, the company had been taking decisions on the product mix, based on the following marginal cost analysis.

	A (` / u)	**B (`/ u)**	
Selling Price	*100*	*120*	
Variable Cost	*60*	*70*	
Contribution	*40*	*50*	
Total fixed costs			*3,00,000*

Since the decisions based on the above approach did not yield the required results, the fixed costs were analysed as follows for 10,000 units of only A or 10,000 units of only B.

Item of Cost	Details for A	A (Amt.)	B (Amt.)	Details for B
Set up cost	10 production runs	40,000	75,000	10 production runs
Distribution cost	₹ 120/ box	60,000	25,000	₹ 200 per box
Step fixed cost	₹ 4,000 per 2,000 units	20,000	50,000	₹ 5,000 per 1,000 units
	Total	1,20,000	1,50,000	

₹ 30,000 can be taken as the unanalysed fixed cost, and unavoidable whether A or B or both are produced.

The following cost reduction measures were taken by the Product Managers of A and B:

	A	B
Increase in number of units per run to	2,000 units	1,250 units
Increase in the number of units per box distributed to	30 units	125 units

Further, the Management ensured availability of raw material and labour to support a production of 15,000 units of either A or B or both together. There was no change to the step costs or contribution. However, the total unanalysed fixed cost increased to ₹ 32,000.

(i) *Based on the principles of Activity Based Costing, prepare a statement showing the contribution and item wise analysed overheads for each product, arrive at the profitability of A and B and then the final profits if 15,000 units of only A or 15,000 units of only B are manufactured.*

(ii) *Find the minimum break-even point in units if only product A is manufactured after the cost reduction.* *(12 Marks)*

(b) *A toy company 'T' expects to successfully launch Toy Z based on a film character. T must pay 15% royalty on the selling price to the film company. 'T' targets a selling price of ₹ 100 per toy and profit of 25% selling price.*

The following are the cost data forecast:

	₹/toy
Component A	8.50
Component B	7.00
Labour: 0.4 hr. @ ₹ 60 per hr	24.00
Product specific overheads	13.50

In addition, each toy requires 0.6 kg of other materials, which are supplied at a cost of ₹ 16 per kg with a normal 4% substandard quality which is not usable in the manufacture.

You are required to determine if the above cost structure is within the target cost. If not, what should be the extent of cost reduction? (4 Marks)

Answer

(a) (i) Statement Showing "Profitability of Product A & B"

Particulars	Product A 15,000 units (₹)	Product B 15,000 units (₹)
Contribution	6,00,000 (15,000 units × ₹40)	7,50,000 (15,000 units × ₹50)
Less: Setup Cost	32,000 (8 runs × ₹4,000)	90,000 (12 runs × ₹7,500)
Less: Distribution Cost	60,000 (500 boxes × ₹120)	24,000 (120 boxes × ₹200)
Less: Step Fixed Cost	32,000 (8 × ₹4,000)	75,000 (15 × ₹5,000)
Less: Un-analyzed Fixed Cost	32,000	32,000
Profit	4,44,000	5,29,000

(ii) Break Even Point "A"

Un-analyzed Fixed Cost is ₹ 32,000

$$\text{Minimum units for BEP} = \frac{₹\ 32,000}{₹\ 40}$$

$$= 800 \text{ units}$$

Setup Cost (fixed for 2,000 units); 1 Production Run; ₹ 4,000/-

Step Cost (fixed for 2,000 units); ₹ 4,000/-

Distribution Cost will have to be recovered on the basis of 30 units.

Let BEP (units) - 'K'

$$40 \times K = ₹\ 32,000 + ₹\ 8,000 + \left(\frac{K}{30 \text{ units}}\right) \text{Boxes} \times ₹120$$

$$K = 1,111.11 \text{ units}$$

Refining, 1,111.11 will have 37.03 boxes or say 38 boxes. The last box will cost ₹ 120 which is *equivalent to* contribution from 3 units. Hence, **BEP** is **1,114 units**.

(b) **Statement Showing Target Cost "Z"**

	₹ / Toy
Target Selling Price	100.00
Less: Royalty @15%	15.00
Less: Profit @ 25%	25.00
Target Cost	60.00

Statement Showing Cost Structure "Z"

	₹ / Toy
Component A	8.50
Component B	7.00
Labour (0.40 hr. × ₹ 60 per hr.)	24.00
Product Specific Overheads	13.50
Other Material (0.6 kg / 96% × ₹16)	10.00
Total Cost of Manufacturing	63.00

Total Cost of Manufacturing is ₹ 63 while Target Cost is ₹ 60. Company "T" should make efforts to **reduce its manufacturing cost by ₹ 3** to achieve Target Selling Price of ₹100.

Question 6

(a) Supreme Limited has two Divisional Profit Centres A and B. A produces two components 'AC' and 'PC' and has a maximum capacity of 1,20,000 hours per annum, which can be used for AC or PC.

The following information is given:

Details	***Division A***		***Division B***
	AC	***PC***	***RAC***
Direct Material ₹/ unit	*25*	*10*	*100*
Imported Component (equivalent of AC) ₹/ unit	*–*	*–*	*450*
Direct Labour and Variable overhead ₹/unit *@ ₹ 50 / hour* *@ ₹ 35 / hour*	*200* *-*	*50* *-*	*-* *350*
Fixed cost ₹/ annum	*30,00,000*		*6,00,000*
External demand (no of units)	*18,000*	*Unlimited*	*6,000*
External selling price (₹/ unit)	*450*	*90*	*1,050*

Division B presently imports a component which is similar to AC at ₹ 450. If it uses AC from Division A, it has to make some modification which will involve two direct labour hours, thereby increasing the cost by ₹ 70/- per modified unit.

What is the minimum transfer price per unit that A will agree to, if the requirement of B is

(i) 12,000 units

(ii) 15,000 units?

(iii) What is the maximum price that B will offer A per unit of AC transferred if its labour hours are restricted to 6,00,000 hours?

Is it in the company's interest that A transfers units to B after meeting its external demand for AC.

(iv) If B's labour hours are restricted to 6,00,000 hours?

(v) If B's labour hours have no limitation?

(Present your answers from a financial perspective and with only relevant figures. A detailed profitability statement is not required). *(8 Marks)*

(b) PH Ltd. makes and supplies pizzas to three college A, B and C across the city. It is exploring the viability of discontinuing C and supplying to a nearer college 'D'. However, there is an extra quantity of 800 units which it can supply to A if it discontinues C. The details are given below:

		A	B	C	D
No. of Pizzas	(existing)	1,500	2,500	4,800	-
	Proposed	*			4,000
Contribution ₹/unit excluding delivery costs		72	67	65	60
(km/delivery) distance		20	30	40	25
No. of deliveries (normal)		100	125	400	200
No. of rush deliveries (₹ 200 / rush delivery)		-	40	20	30
Normal Delivery Cost (₹ /km) (not applicable to rush deliveries		20	20	20	20

* *If it has to supply 800 extra units to A, if has to reduce the price on the original supply also. Moreover, these 800 units will involve 65 normal deliveries and 20 rush deliveries.*

(i) Prepare a customerwise profitability statement based on the existing quantities given in the table for A, B and C and the proposed 4,000 numbers for D.

(ii) By how much can PH reduce the price per unit supplied to college A in order to justify the additional supply? *(8 Marks)*

Answer

(a) Basic Workings

Statement Showing "Contribution *per unit*"

(₹)

Particulars	Division A		Division B
	AC	PC	RAC
External Demand (units)	**18,000**	**unlimited**	**6,000**
Selling Price …(A)	450.00	90.00	1,050.00
Direct Material	25.00	10.00	100.00
Imported Component	---	---	450.00
Direct Labour& Overheads	200.00	50.00	350.00
Variable Cost …(B)	225.00	60.00	900.00
Contribution …(A) – (B)	225.00	30.00	150.00
Hours	4.00	1.00	10.00
Contribution/ Hour	56.25	30.00	15.00

Division A

Allocation of Hours *on the basis of contribution/hour*

Production of AC = **18,000 units**

Hours Required = 72,000 hrs (18,000 units × 4.0 hrs.)

Balance Hours Available = 48,000 hrs (1,20,000 hrs. − 72,000 hrs.)

Production of PC = **48,000 units** $\left(\frac{48{,}000\ \text{hrs}}{1\ \text{hr}/\text{u}}\right)$

NOTE

Analysis of Hours Available and Required in Division B

Particulars	*If Requirement*		
	6,000 units	12,000 units	15,000 units
Hrs. Required for Manufacturing @ 10 p.u.	60,000 hrs.	1,20,000 hrs.	1,50,000 hrs.
Hrs. Required for Modification @ 2 p.u.	12,000 hrs.	24,000 hrs.	30,000 hrs.
Total Hrs. Available	6,00,000 hrs.	6,00,000 hrs.	6,00,000 hrs.

Division B's *required hours* are less than the *available hours* (considered various scenarios). Hence, the same has no impact on the figures arrived specifically for point (iii), (iv) & (v).

(i) Minimum Transfer Price *per unit*

If Requirement of B is 12,000 units

Transfer Price = Variable Cost + Opportunity Cost

$$= \text{`}225 + \frac{(48{,}000 \text{ hrs.} \times \text{`}30)}{12{,}000 \text{ units}}$$

= ₹ 345

(ii) Minimum Transfer Price *per unit*

If Requirement of B is 15,000 units

Transfer Price = Variable Cost + Opportunity Cost

$$= ₹225 + \frac{(48{,}000 \text{ hrs.} \times ₹30) + (12{,}000 \text{ hrs.} \times ₹56.25)}{15{,}000 \text{ units}}$$

= ₹ 366

(iii) Maximum Price (B will Offer A)

The price being paid to Outside Supplier *less* Cost of Modification

= ₹ 450 – ₹ 70

= ₹ 380

(iv) & (v)

Division B is not in a position to sell more than 6,000 units as given in the question and therefore any transfer of component from Division A of over 6,000 units will NOT be in the overall interest of the company. Although Division B has spare hours of 5,40,000 hours (6,00,000 - 60,000) which will not help it to increase its sales.

If division B able to sell entire units transferred, then

Company would be able to save ₹ 35 *per unit*.

Cost of Modified 'AC' vs Cost of Imported Component

Particulars	Modified 'AC' (₹)	Imported Component (₹)
Transfer Price 'AC'	345	---
Cost of Modification (2 hrs. × ₹ 35)	70	---
Cost of Import	---	450
Effective Cost *per unit*	**415**	**450**

(b) (i) Customer Wise "Profitability Statement"

Particulars	A (₹)	B (₹)	C (₹)	D (₹)
No. of Pizzas	**1,500**	**2,500**	**4,800**	**4,000**
Contribution	1,08,000 (1,500 × ₹ 72)	1,67,500 (2,500 × ₹67)	3,12,000 (4,800 × ₹65)	2,40,000 (4,000 × ₹60)
Less: Normal Delivery Cost	40,000 (₹20 × 20km × 100)	75,000 (₹20 × 30km × 125)	3,20,000 (₹20 × 40km × 400)	1,00,000 (₹20 × 25km × 200)
Less: Rush Delivery Cost	---	8,000 (₹200 × 40)	4,000 (₹200 × 20)	6,000 (₹200 × 30)
Operating Income	68,000	84,500	(-) 12,000	1,34,000

(ii) Statement Showing – Revised Price *per unit* "A"

Particulars		₹
Existing Operating Income from 'A'		68,000
Revised – Normal Delivery Costs (₹20 × 20km × 165)		66,000
Revised – Rush Delivery Costs (₹200 × 20)		4,000
Total Contribution to be earned from Sales to "A"	…(A)	1,38,000
Revised No. of Pizzas (1,500 + 800)	…(B)	2,300
Reduced Contribution p.u.	…(A)/ (B)	60.00

PH cannot reduce the price by more than **₹ 12** *per unit*.

Question 7

*Answer any **four** out of the following **five** questions:*

(a) The following is the data for a minimisation problem of a linear program in the simplex method.

Minimise $Z = 3x_1 + 4x_2$, *subject to*

$$2x_1 + 3x_2 \geq 150$$

$$4x_1 + 3x_2 \geq 120$$

$$x_1, x_2 \geq 0$$

Assume usual notations for additional variables s_1, s_2 *for conversion to equality.*

(i) What would be the coefficient of the artificial variables in the objective function? Why?

(ii) Will s_1 *and* s_2 *be part of the initial solution? Why?*

(b) *the following information is given about the type of defects during a production period and the frequencies of their occurrence in a spectacle manufacturing company:*

Defect	*No. of items*
End Frame not equidistant from the centre	*10*
Non-uniform grinding of lenses	*60*
Power mismatches	*20*
Scratches on the surface	*110*
Spots / Stains on lenses	*5*
Rough edges of lenses	*70*
Frame colours-shade differences	*25*

Construct a frequency table so that a Pareto Chart can be constructed for the defect type. Which areas should the company focus on?

(c) *Classify the following items under the three measures used in the theory of constraints: viz Throughput Contribution, Operating Costs and Investments.*

(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 equipment and buildings

(d) *(i) Is it necessary to start preparing a functional budget only after identifying the principal budget factor? Explain.*

(ii) Is it practical to make a flexible production cost budget before the commencement of production activities of a certain production period? Why?

(e) *Classify the following costs into one or more the following categories: Relevant cost, Opportunity cost, Sunk cost, Notional cost and Historical cost.*

A company wishes to manufacture 'Smart' watches that can be interactive with mobile phones, computers and CCTV systems. It is planning to do research on the compatibility. It has done market survey and is satisfied about the demand being sufficient for making the product profitable. Some facilities can be made available by discontinuing its existing line of telephone instruments division.

(i) R & D costs indicated above

(ii) Cost of Market Survey

(iii) The profit of the Telephone Instruments Division *(4 × 4 = 16 Marks)*

Answer

(a) (i) When the problem is of the minimization nature, we assign in the objective function a coefficient of **+M** to each of artificial variables. It is attempted to prohibit the appearance of artificial variables in the solution by assigning these coefficients: an *extremely large value* when objective is to minimize.

(ii) s_1, $s_2$will NOT be part of the initial solution.

If Surplus Variables are included in the basis, the elements of the Surplus Variables will be –1. This is contrary to the *non-negativity restriction*. This problem is solved by adding Artificial Variable to the equations, that is, a variable that has a positive value.

Artificial Variables do not represent any quantity relating to the decision problem and must not be present in the final solution (if at all they do, it represents a situation of infeasibility).

Accordingly, in the initial tableau we will place Artificial Variables only to eliminate the impact of them first.

(b) **Statement Showing "Pareto Analysis of Defects"**

Defect Type	No. of Items	% of Total Items	Cumulative Total
Scratches on the surface	110	36.67%	36.67%
Rough edges of lenses	70	23.33%	60.00%
Non-uniform grinding of lenses	60	20.00%	80.00%
Frame colours-shade differences	25	8.33%	88.33%
Power mismatches	20	6.67%	95.00%
End frame not equidistant from the centre	10	3.33%	98.33%
Spots/ Strain on lenses	5	1.67%	100.00%
	300	100.00%	

The company should focus on eliminating *scratches on the surface*, *rough edges of lenses* and *grinding of lenses* related defects which constitute **80% portion**, according to Pareto Theory.

(c)

Throughput Contribution	Raw Material for Production
	Sales
Operating Costs	Rent / Utilities
	Depreciation
	Labour
Investments	Research and Development Cost
	Raw Material Stock
	Building and Equipment Cost

(d) **(i)** The principal budget factor is the factor which limits the activities of the organization. The early identification of this factor is important in the budgetary planning process because *it indicates which budget should be prepared first*. For example, if sales volume is the principal budget factor, then the sales budget must be prepared first, based on the available sales forecasts. All other budgets should then be linked to this.

(ii) A flexible production cost budget calculates different cost levels but it depends on the *activity levels experienced*. It requires actual cost and activity levels (as *input*) of certain production period. Accordingly, it is not practicable to make a flexible production cost budget before the commencement of production activities.

(e) Cost Classification

R & D costs indicated above	Relevant Cost
Cost of Market Survey	Sunk Cost
The profit of the Telephone Instruments Division	Opportunity Cost, Relevant Cost