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 respective answers.

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

Question 1

(a) *X Ltd. is a prominent Eye Testing machines manufacturing Company. It has several types of eye testing machines in its portfolio, each of which are yielding progressive returns. The company has developed and launched its innovative machine the 'Eye Care' in the market. The data relating to its cost structure are given below:*

	₹ per unit
Raw Materials	42,000
Imported Parts	8,000
Direct labour	6,000
Other Variable Costs	9,000
Fixed overheads	25,000

Market research has indicated that at a selling price of ₹1,00,000 no order will be received, but the demand for 'Eye Care' will be increased by four units with every ₹10,000 reduction in the unit selling price below ₹1,00,000.

Determine the unit selling price of 'EYE Care' that will maximize the profit of X Ltd.

(5 Marks)

(b) *Using the same material P-72, Sigma Limited manufactures two products - SX and ZX. It is ascertained that during the year 2021-22, the supply of material P-72 will be limited to 1,50,000 kg. The following information relates to products SX and ZX :*

Particulars	SX	ZX
Annual Demand	12,000 units	15,000 units
Variable production cost per unit	₹120	₹150
Material (P-72) required for each unit of output	4kg	10 kg

A subcontractor has· quoted prices to supply SX @ ₹180 per unit and ZX @ ₹260 per unit.

Required:

(I) Calculate how many units of SX and ZX should be manufactured by Sigma Limited and how many units should be purchased from the subcontractor in order to maximise profits.

(II) From financial perspective, what do you need to ensure in order to justify your answer in (I) above? ***(5 Marks)***

(c) PQR Limited has two departments that produce two separate product lines. The company has been implementing Total Quality Management (TQM) over the past year. Revenue and costs of quality for that year are given below.

Particulars	*Department K (₹)*	*Department P (₹)*	*Total (₹)*
Sales	*92,00,000*	*1,10,00,000*	*2,02,00,000*
Costs of quality:			
Prevention costs	*1,86,000*	*1,24,500*	*3,10,500*
Appraisal costs	*1,36,000*	*68,000*	*2,04,000*
Internal failure costs	*94,000*	*1,97,500*	*2,91,500*
External failure costs	*44,000*	*1,60,000*	*2,04,000*
Total costs of quality	***4,60,000***	***5,50,000***	***10,10,000***

Required:

Identify type department which is taking a more serious approach to implement TQM, based on the department wise computation and analysis of the following:

(i) Total costs of quality as a percentage of sales.

(ii) Ratio of costs of conformance to total costs of quality.

(iii) Ratio of costs of non-conformance to total costs of quality.

(iv) Costs of non-conformance as a percentage of sales. ***(5 Marks)***

(d) A co-operative farm is engaged in dairy business. It is considering using a combination of cow feeds available from local suppliers. It would like to feed the cows at minimum cost while also making sure each cow receives an adequate supply of calories and vitamins. The cost, calorie content, and vitamin content of each feed ·are given in the table below.

Contents	*Feed Type I*	*Feed Type II*
Calories (per kilogram)	*800*	*1,000*
Vitamins (per kilogram)	*150 units*	*80 units*
Cost (per kilogram)	*₹15*	*₹30*

Each cow requires at least 18,000 calories per day and at least 7,000 units of vitamins. A further constraint is that not more than one-third of the diet (by weight) can consist of Feed Type I, since it contains an ingredient which is toxic if consumed in too large quantity.

Required:

(i) Formulate a linear programming model for this problem.

(ii) In order to solve the problem using simplex method how many slack and surplus variables need to be introduced. Mention the constraints where these variables are to be introduced.

(iii) Explain the meaning of slack variables and shadow price. ***(5 Marks)***

Answer

(a) Calculation of Selling Price of 'Eye Care' that will maximize the profit.

As per economic theory of pricing P = a-bQ and profit is maximum at a level of output at which Marginal revenue (MR) is equal to Marginal cost (MC), where,

P = Price

b = Slope of demand curve i.e. [Change in Price / Change in Quantity]

Q = Quantity demanded

a = Price at which demand is zero

We know that,

MR = a – 2bQ*

= 1, 00,000 – 2 (10,000 / 4) Q

= 1, 00,000 – 2 (2500) Q

MR = 1, 00,000 – 5000 Q

MC = Variable cost = (42,000 + 8,000 + 6,000 + 9,000)

MC = ₹65, 000

MR = MC

(1,00,000 – 5000 Q) = 65,000

5,000 Q = 1,00,000 – 65,000

= 35,000

Therefore, Q = 35,000 / 5 = **7 units**

Substitute the value of Q in price equation

P = a – bQ

P = 1,00,000 – (2500 x 7) = (1,00,000 – 17,500)

P = ₹ 82,500

Therefore, at the price of ₹82,500 per unit, the profit will be maximum.

(b) (I) Computation of units to be manufactured and purchased to maximize profits

	SX	**ZX**
	₹	**₹**
Quoted purchase price p.u.	180	260
Variable production cost p.u.	120	150
Savings in production p.u.	60	110
Raw material required p.u. for production (kg)	4	10
Savings per kg if produced (₹)	**15**	**11**
Ranking of savings in production	I	II

Savings per kg of material used for production of SX is higher than used for production of ZX. Therefore, maximum units of SX should be produced and the balance material of P-72 should be used to produce ZX. Accordingly, the production should be as follows:

Product	Units	Material p.u. (kg)	Material used (kg)
SX	12,000	4	48,000
ZX	10,200	10	1,02,000 (Bal.fig.)
Total			1,50,000

Therefore, number of units ZX to be purchased = 15,000 – 10,200 = 4,800 units

(II) The above proposed no. of units of production and purchase always holds good when the buying price and variable production cost p.u. are as detailed below:

	SX	**ZX**
Buying price p.u.	**More than ₹164** (164 - 120 = 44 / 4 = ₹11)	**Less than ₹300** (300 – 150 = 150 / 10 = ₹15)
Variable production Cost p.u.	**Less than ₹136** (180 – 136 = 44 / 4 = ₹11)	**More than ₹110** (260 – 110 = 150 / 10 = ₹15)

The above set price and cost p.u. should be ensured to justify the answer derived in (I) above from financial perspective.

(c) Computation of conformance and non – conformance costs

Costs	Department K (₹)	Department P (₹)
Prevention costs	1,86,000	1,24,500
Appraisal costs	1,36,000	68,000
Cost of conformance	3,22,000	1,92,500
Internal failure costs	94,000	1,97,500
External failure costs	44,000	1,60,000
Cost of non - conformance	1,38,000	3,57,500

Quality conformance costs are the costs that are incurred by a firm to avoid quality failures. Quality non – conformance costs are the costs that are incurred by a firm due to the outcome of quality failures that have occurred.

Total costs of quality as a percentage of sales	(4,60,000 / 92,00,000) x 100 **5%**	(5,50,000/ 1,10,00,000) x 100 **5%**
Ratio of costs of conformance to total costs of quality	3,22,000 : 4,60,000 **0.70:1**	1,92,500 : 5,50,000 **0.35:1**
Ratio of costs of non-conformance to total costs of quality	1,38,000 : 4,60,000 **0.30:1**	3,57,500 : 5,50,000 **0.65:1**
Costs of non- conformance as a percentage of sales	(1,38,000 / 92,00,000) x100 **1.5%**	(3,57,500/ 1,10,00,000) x 100 **3.25%**

Analysis: From the computations it is observed that both the departments have spent 5% of sales as costs of quality. But, Department K has spent 70% of its costs of quality on conformance of quality; which is 35% in Department P. Therefore, it is obvious that Department K is taking a more serious approach to implement TQM. Same is also justified by the "Cost of Non-conformance as a percentage of sales", which is lower in Department K.

(d) Let x_1 and x_2 be the quantity (in kgs) of Feed Type I and Feed Type II respectively used per day

Let Z be the total daily cost of the feed per cow.

(i) Formulation of linear programming model

Minimize Z = ₹15 x_1 + ₹30 x_2

Subject to constrains:

$800\ x_1 + 1000\ x_2 \geq 18,000$

$150\ x_1 + 80\ x_2 \geq 7,000$

$2/3\ x_1 - 1/3\ x_2 \leq 0$ or $x_1 \leq 1/3(x_1 + x_2)$

$x_1 \geq 0\ ,\ x_2 \geq 0$

(ii) To solve this problem one slack variable and two surplus variables are need to be introduced.

Toxic constraint – slack variable

Calorie requirement constraint

Vitamins requirement constraint — Surplus variables

(iii) **Slack variable:** In an optimization problem, a slack variable is a variable that is **added to** an inequality constraint to transform it into an equality. Introducing a slack variable replaces an inequality constraint with an equality constraint and a non-negativity constraint on the slack variable.

Shadow price: The shadow price shows the additional contribution generated by relaxing a constraint and thus sets an upper limit on the cost of acquire one more unit of constraining factor or this price represents the opportunity cost of not having the use of the one extra unit.

Question 2

(a) CTX Ltd. is a manufacturer of a product sold under the brand name 'Caltel' at ₹400 each. It has a production capacity of 40,000 units per month. As projected by the company, it expects to sell 25,000 units per month in the next quarter and submits the following costs and revenues for the next month.

Particulars		
Sales (25,000 units @ ₹400 per unit)		*1,00,00,000*
Less: Direct material	*20,00,000*	
Less: Direct labour	*35,00,000*	
Less: Variable manufacturing overheads	*4,50,000*	
Less: Fixed manufacturing overheads	*20,00,000*	
Less: Fixed selling and distribution overheads	*7,50,000*	
Total costs		*87,00,000*
Profit		*13,00,000*

CTX Ltd. is not expecting an increase in demand for the product of the company and it estimates that demand in the foreseeable future will remain at 25,000 units per month. Direct labour and fixed overheads cannot be reduced in the short run.

A potential customer Decagon Ltd. has offered to enter into a contractual agreement to purchase 15,000 units per month for the next three years at an agreed price of ₹ 260 per unit. A special logo is to be printed on the product which will cost ₹ 8 per unit. No selling and distribution cost would be incurred for the order.

However, the following would emerge, if the offer is not accepted and a decision is taken by the company to reduce capacity permanently by 15,000 units per month:

- *Direct labour to the extent of 37.5 % will be made redundant and there would be no redundancy costs.*
- *Savings in fixed manufacturing overheads would be ₹ 8,00,000 per month.*
- *Savings in fixed selling and distribution overheads would be ₹ 3,10,000 per month.*

Required:

(i) Advise whether it would be beneficial for CTX Ltd. to accept the offer of Decagon Ltd.

(ii) Explain the factors involved in decisions relating to expansion and contraction of business. ***(8 Marks)***

(b) Jupiter Limited is planning to launch a new product in the market. The team involved in feasibility study has provided the following data for the first year.

The variable cost per unit, total fixed cost, selling price per unit and the probabilities associated with these random variables are as follows:

Variable cost		*Fixed cost*		*Selling price per unit and sales volume*		
Variable cost per unit (₹)	*Probability*	*Total fixed cost (₹)*	*Probability*	*Selling price per unit (₹)*	*Sales Volume (units)*	*Probability*
14.60	*0.10*	*1,00,000*	*0.10*	*22.00*	*30,000*	*0.15*
14.80	*0.20*	*1,20,000*	*0.15*	*23.00*	*29,000*	*0.25*
15.00	*0.30*	*1,50,000*	*0.25*	*24.00*	*27,000*	*0.30*
15.20	*0.20*	*2,00,000*	*0.30*	*24.50*	*26,000*	*0.20*
15.50	*0.20*	*2,40,000*	*0.20*	*26.00*	*22,500*	*0.10*

Random Numbers to be used are as follows:

	Random Numbers							
For selling price per unit	*97*	*95*	*12*	*11*	*90*	*49*	*57*	*15*
For variable cost per unit	*86*	*81*	*02*	*92*	*75*	*91*	*24*	*58*
For fixed cost	*39*	*22*	*13*	*02*	*80*	*67*	*14*	*99*

Sales volume corresponds to each selling price and thus sales volume not to be considered as a separate random variable.

Required:

Using simulation process, repeat the trial 8 times and calculate the expected profit from the new product to be launched. ***(8 Marks)***

Answer

(a) (i) **Evaluation of options**

Utilisation of Surplus Capacity (per month) (₹)		**Reduce Capacity Permanently (per month) (₹)**	
Contractual Sales (15,000 units x ₹ 260)	39,00,000	Savings in fixed manufacturing overheads	8,00,000
Material (₹ 20,00,000/25,000 units x 15,000 units)	12,00,000	Savings in fixed selling and distribution overheads	3,10,000
Special Logo (₹ 8 x 15,000 units)	1,20,000	Saving in Labour Cost (₹ 35,00,000x37.5%)	13,12,500
Variable manufacturing overheads (₹ 4,50,000/25,000 units x 15,000 units)	2,70,000		
	23,10,000		**24,22,500**

Alternative Presentation

Evaluation of options

Particulars	**25,000 units ₹**	**40,000 units ₹**	**15000 units ₹**
Sales	1,00,00,000	1,39,00,000	**39,00,000**
Less: Direct material	20,00,000	32,00,000	**12,00,000**
Less: Direct Labour	21,87,500	35,00,000	**13,12,500**
Less: Variable manufacturing overheads	4,50,000	7,20,000	**2,70,000**
Less: Fixed manufacturing overheads	12,00,000	20,00,000	**8,00,000**

Less: Fixed selling and distribution overheads	4,40,000	7,50,000	**3,10,000**
Less: logo cost at the rate of ₹8 p.u.	-	1,20,000	**1,20,000**
Profit / Loss	37,22,500	36,10,000	**-1,12,500**

Advise:

Accepting the offer to supply 15,000 units will lead to a loss of ₹1,12,500 p.m. Therefore, it is not beneficial to CTX Ltd., to accept the offer of Decagon Ltd.

(ii) Factors to be considered while taking a decision to expand the capacity:

- Additional Fixed Costs involved
- Possible decrease in Selling Price due to increased production capacity
- Whether demand is sufficient to absorb the increased production

Factors to be considered while taking decision relating to contraction of business:

- Savings in fixed overhead
- Loss of Marginal Contribution
- Loss of resources with specific skills

(b) Computation of expected profit from the new product

Assignment of random numbers for Variable Cost

Variable Cost p.u.	Probability	Cumulative Probability	Random Numbers allocated
14.60	0.10	0.10	00 - 09
14.80	0.20	0.30	10 - 29
15.00	0.30	0.60	30 - 59
15.20	0.20	0.80	60 - 79
15.50	0.20	1.00	80 - 99

Assignment of random numbers for Fixed Cost

Total Fixed Cost	Probability	Cumulative Probability	Random Numbers allocated
1,00,000	0.10	0.10	00 - 09
1,20,000	0.15	0.25	10 - 24
1,50,000	0.25	0.50	25 - 49

2,00,000	0.30	0.80	50 - 79
2,40,000	0.20	1.00	80 - 99

Assignment of random numbers for Selling Price per unit

Selling Price p.u.	Probability	Cumulative Probability	Random Numbers allocated
22.00	0.15	0.15	00 - 14
23.00	0.25	0.40	15 - 39
24.00	0.30	0.70	40 - 69
24.50	0.20	0.90	70 - 89
26.00	0.10	1.00	90 - 99

Simulation Table

	Sales				Variable Cost			Fixed Cost		Total Cost (VC+FC) (₹)	Net Profit (₹)
Sl. No.	RN	Selling Price p.u. (₹)	Sales Units	Total Sales (₹)	RN	V. Cost p.u. (₹)	Total V. Cost (₹)	RN	Total F. Cost (₹)		
1	97	26.00	22,500	5,85,000	86	15.50	3,48,750	39	1,50,000	4,98,750	86,250
2	95	26.00	22,500	5,85,000	81	15.50	3,48,750	22	1,20,000	4,68,750	1,16,250
3	12	22.00	30,000	6,60,000	02	14.60	4,38,000	13	1,20,000	5,58,000	1,02,000
4	11	22.00	30,000	6,60,000	92	15.50	4,65,000	02	1,00,000	5,65,000	95,000
5	90	26.00	22,500	5,85,000	75	15.20	3,42,000	80	2,40,000	5,82,000	3,000
6	49	24.00	27,500	6,48,000	91	15.50	4,18,500	67	2,00,000	6,18,500	29,500
7	57	24.00	27,500	6,48,000	24	14.80	3,99,600	14	1,20,000	5,19,600	1,28,400
8	15	23.00	29,000	6,67,000	58	15.00	4,35,000	99	2,40,000	6,75,000	-8,000
Total Profit/Loss											5,52,400

Total Net Profit = ₹5,52,400

Therefore, **expected profit** from the new product = ₹5,52,400/8 = **₹69,050**

Question 3

(a) *PCB Limited manufactures a component GB 321X which is used in the engine of four stroke 125CC Bharat Stage-6 compliant motorcycle.*

For the month of April 2021, the budgeted sales were 1,200 units of the component. The budgeted selling price was ₹3,600 per component. During April 2021, the actual records showed that 1,650 units of the component were produced and sold for ₹57,75,000.

Standard cost card per unit of the component and actual cost data for April 2021 are as follows:

Standard cost card per unit of component		*Actual for 1650 units*	
Cost item		*Quantities*	
Direct Materials (12 kg@ ₹150 per kg)	*1,800*	*13,200 kgs*	*21,12,000*
Direct labour (1.5 hrs@ ₹240 per hour)	*360*	*1,980 hours*	*4,95,000*
Variable overheads (1.5 hrs @ ₹60 per hour)	*90*	*1,980 hours*	*1,48,500*
Total	*2,250*		*27,55,500*

Required:

(i) Prepare a statement reconciling the budgeted contribution and actual contribution for the month of April 2021 showing the amounts and nature (favourable or adverse) of the following variances:

- *Material price and usage variance*
- *Labour rate and efficiency variance*
- *Variable overhead efficiency and expenditure variance*
- *Sales price variance and sales margin volume variance*

(ii) Identify the variances that have mostly contributed to increase in actual contribution from the budgeted contribution and explain the factors responsible for such change,

(iii) In the light of the above, advise whether there is any need for revision of the standard cost card in the forthcoming budget period. ***(10 Marks)***

(b) PKG Limited has three warehouses which stores a given product. These warehouses supply the product to four dealers. The supply and demand in units and the corresponding unit transportation cost are given. The following solution is prepared by Operational manager of the company.

	Dealers				
	D1	***D2***	***D3***	***D4***	*Supply*
W1	27 [30]	23 [70]	31 [50]	69	*150*
W2	*10*	*45*	*40*	32 [40]	*40*
W3	30 [60]	*54*	*35*	57 [20]	*80*
Demand	*90*	*70*	*50*	*60*	*270*

Required:

(i) Is this solution degenerate?

(ii) Is this solution optimum?

(iii) Calculate the minimum transportation cost.

(iv) Is this solution unique? ***(6 Marks)***

Answer

(a) Given:

Standard Price per Kg of material	= ₹150
Actual quantity of material	= 13,200 Kgs
Standard rate per labour hour	= ₹240
Actual hours	= 1980
Standard variable overhead rate per hour	= ₹60
Standard selling price per unit	= ₹3,600
Actual sales volume	= 1,650 units
Budgeted sales volume	= 1,200 units

Derived:

Actual Price per Kg of material = 21,12,000/13,200 = ₹160

Standard quantity for actual production = (1650 x 12) = 19,800 Kgs

Actual rate per Labour hour = 4,95,000/1980 = ₹250

Standard hours for actual production = 1.5 x 1650 = 2475

Actual variable overhead rate = 1,48,500/1,980 = ₹75

Actual selling price per unit = 57,75,000/1650 = ₹3,500

Standard Margin p.u. = Standard Selling Price p.u.– Standard Variable Cost p.u.

= 3600-2250 = ₹1,350

Computation of Variances:

Material Price Variances = (SP-AP) x AQ

= (150-160) x 13,200 = **₹1,32,000 A**

Material Usage Variance = (SQ-AQ) x SP

= (19,800-13,200) x 150 = **₹9,90,000 F**

Labour Rate Variance = (SR-AR) x AH

= (240-250) x 1980 = **₹19,800 A**

Labour Efficiency Variance = (SH-AH) x SR

= (2475-1980) x 240 = **₹1,18,800 F**

Variable OH Efficiency Variance = (SH-AH) x SR

= (2475-1980) x 60 =**₹29,700 F**

Variable OH Expenditure Variance = (SR-AR) x AH

= (60-75) x 1980 = **₹29,700 A**

Sales Price Variance = (Actual SP-Standard SP) x Actual Sales Vol.

= (3500-3600) x 1650 = **₹1,65,000 A**

Sales Margin Volume Variance = (Actual Sales Vol.- Budgeted Sales Vol.) x Standard Sales Margin p.u.

= (1650-1200) x 1350 = **₹6,07,500 F**

(i) Reconciliation of Budgeted and Actual Contribution

Particulars	Favourable ₹	Adverse ₹	Total ₹
Total Budgeted Contribution 1200 units @ ₹1350	-	-	16,20,000
Material Price Variance	-	1,32,000	
Material Usage Variance	9,90,000	-	
Labour Rate Variance	-	19,800	
Labour Efficiency Variance	1,18,800	-	
VOH Efficiency Variance	29,700	-	
VOH Expenditure Variance	-	29,700	
Sales Price Variance	-	1,65,000	
Sales Margin Vol. Variance	6,07,500	-	
Difference in Variance	17,46,000	3,46,500	13,99,500
Total Actual Contribution (Actual Total Sales – Actual Total V. Cost) (57,75,000-27,55,500)			30,19,500

(ii) Mostly contributed variances for the increase in actual contribution:

Material Usage Variance

Labour Efficiency Variance

Sales Margin Volume Variance

Factors responsible for increase in actual contribution:

Acquisition of **better quality materials** at a little bit of higher price results lesser consumption of material and labour hours causing considerable amount of favorable material usage variance, labour efficiency variance and variable overheads efficiency variance.

As a result of a **small reduction in selling price** (₹ 100 p.u.), the company was able to sold 450 units more than the budgeted volume which contributed a good amount of favorable sales margin volume variance.

(iii) Yes, there is a need to revise the standard cost card in the forth coming budget period. Especially, the requirement of material and labour hours for the budgeted output need to be revised. Otherwise, they may give misleading favorable variances, while evaluating performance of the company.

(b) (i) When the number of positive allocations at any stage of the feasible solution is less than the required number (rows + columns -1), the solution is said to be *degenerate solution*.

In given solution total allocated cells are 6 which are equal to 3+4-1 (rows + columns - 1). Therefore, the initial basic solution is not a degenerate solution.

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

					u_i
	27	23	31	54	0
	5	1	9	32	-22
	30	26	34	57	3
v_j	27	23	31	54	

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

			15
5	44	31	
	28	1	

Since opportunity cost in all the Δ_{ij} (unoccupied cells) is positive, the initial **solution is an optimal solution.**

(iii) Calculation of Minimum Transportation Cost

		Total Minimum Cost
W1 to D1	27x 30	810
W1 to D2	23x70	1,610
W1 to D3	31x50	1,550
W2 to D4	32x40	1,280
W3 to D1	30x60	1,800
W3 to D4	57x20	1,140
Total Minimum Transportation Cost		8,190

(iv) Since all of the ∆ij's are greater than 0, the above solution is unique. No Alternative solutions exist. ['Zero' element in the Δ_{ij} matrix reveals the possibility of an alternative solution.]

Question 4

(a) APS Associates, an advertising firm, performs on going services for three Customers: A, B and C. The revenues and costs for the past year are as under:

APS ASSOCIATES ***Customer Profitability Analysis***				
Particulars	***A (₹)***	***B (₹)***	***C (₹)***	***Total***
Revenue (fees charged)	*4,50,000*	*2,70,000*	*3,50,000*	*10,70,000*
Operating Costs:				
Cost of services (variable)	*3,70,000*	*2,20,000*	*3,30,000*	*9,20,000*
Salaries, rent and general				
administration (fixed)	*44,000*	*26,000*	*38,000*	*1,08,000*
Total operating costs	*4,14,000*	*2,46,000*	*3,68,000*	*10,28,000*
Operating profit	*36,000*	*24,000*	*(18,000)*	*42,000*

APS Associates is considering dropping customer C's account. Total fixed costs would not be affected by the decision to discontinue customer C.

Required:

(i) Using differential analysis advise whether APS Associates should discontinue customer C's account.

(ii) *Suppose, after dropping customer C, the firm can utilise the capacity to generate a contribution margin of ₹ 35,000 per year from a new customer 'P' involving a direct fixed cost of ₹ 13,000 per year.*

Purely from a financial perspective advise whether the firm should accept the new customer P's account.

(iii) *Advise the non-financial factors that should also be considered in (ii) above before coming to a final decision.*

(iv) *State any four benefits of customer profitability analysis.* ***(8 Marks)***

(b) *ABC Ltd. manufactures an auto component X in two operations machining and finishing. Machining operations are carried out in Department P and finishing Operations are carried out in Department Q, the details of which are given below:*

	Department P	*Department Q*
Annual Production	*2,40,000 units*	*2,00,000 units*
Annual Production	*2,00 000 units*	*2,00,000 units*
Fixed operating costs other than direct materials	*₹ 12,00,000*	*₹ 6,00,000*
Fixed operating costs per unit produced	*₹ 6 per unit*	*₹ 3 per unit*

The selling price of' Component X is ₹ 150 per unit with a direct material cost of ₹ 120 incurred at the start of operations in Department P and there are no other variable costs to the company. ABC Ltd. can sell whatever output it produces.

You are required to answer the following independent situations on the basis of throughput accounting:

(i) *ABC Ltd. is planning to make use of some modern tools in the Department Q. If these tools are used, the final output would increase by 5,000 units per annum. These tools costs ₹ 75,000 per annum to ABC Ltd. Should ABC Ltd. acquire these modern tools?*

(ii) *The production manager of Department P has come up with a proposal of faster set ups that would increase the annual capacity of the Department P by 18,000 units per annum with a cost of ₹ 40,000 a year. Should this suggestion be implemented?*

(iii) *An outside contractor has offered to do finishing operations for 20,000 units of Department Q at a unit cost of ₹ 9 which is three times the fixed operating unit cost of Department Q. Should ABC Ltd accept the proposal?*

(iv) *ABC Ltd. produces 4,000 defective units at the machine operations in Department P and another 5,000 units at the finishing operations in Department Q. What is the cost to ABC Ltd. of the defective units produced in both the Departments. Explain your answer briefly.* ***(8 Marks)***

Answer

(a). (i) Differential Analysis:

Particulars	Present Position (₹)	Position after dropping customer C (₹)	Difference (₹)
Revenue	10,70,000	7,20,000	3,50,000 (decrease)
Operating Costs:			
Cost of Service (Variable)	9,20,000	5,90,000	3,30,000 (decrease)
Salaries, rent and general administration (Fixed)	1,08,000	1,08,000	No Change
Total operating costs	10,28,000	6,98,000	3,30,000 (decrease)
Operating Profit	42,000	22,000	20,000 (decrease)

Dropping of customer C's account would reduce the profit of the firm by ₹20,000/-. Hence, the firm is **advised not to drop customer C's account.**

(ii) Analysis of accepting new customer P:

	₹
Additional Contribution margin from P =	35,000
Less: Direct Fixed cost	13,000
Net Margin from customer P	**22,000**
Loss of contribution margin by dropping C	20,000
Net increase in total Profit	2,000

From financial perspective, the firm should accept the new customer P after dropping C, as this will give an increase in profit of ₹2,000/-

(iii) From the new customer P, there will not be much increase in the total profit of the firm. Before coming to a final decision, the firm should seek ways to improve the profitability of the customer C. The firm should also consider the effect that the decision might have on its reputation for developing stable long-run customer relationship.

(iv) Benefits of customer profitability analysis:

- It helps the supplier to identify which customers are eroding overall profitability and which customers are contributing to it.
- It can help to provide a basis for constructive dialogue between buyer and seller to improve margins.
- It enhances decision making related to customers.
- It helps in effective cost reporting, communication and information.
- It helps to find out the value and profitability of each customer segment.

(b) Analysis of various situations on the basis of throughput accounting:

(i) Department Q is in bottleneck operation. Therefore, any increase in production of this department would increase the contribution and operating income.

	₹
Increase in Contribution = [(150 – 120) x 5000]	= 1,50,000
Less: Incremental Cost of Modern tools	= 75,000
Net increase in Contribution	= **75,000**

As the expected benefit from the installation of modern tools is more than its cost, it is **advisable** to acquire the tools.

(ii) Department P is not having any bottleneck operation. It has an excess capacity and hence increasing the capacity will not increase the contribution margin. Therefore, there would be no benefit for the company if the annual capacity of Dept. P is increased by 18,000 units by spending ₹40,000/-. Hence, the suggestion **should not be implemented.**

(iii) Department Q is in bottleneck operation. Therefore, any increase in production of Dept. Q would increase the contribution and operating income.

Increase in contribution margin = (150 - 120) x 20,000	= 6,00,000
Less: Incremental sub-contract cost (20,000 x 9)	= 1,80,000
Incremental Contribution	**4,20,000**

As the incremental contribution is more than the sub-contract cost, **the contract should be accepted**.

(iv) The cost of defectives of 4,000 units in Dept. P is (4,000 x 120) = ₹4,80,000/-.

There is no opportunity cost for Dept. P as it has no bottleneck operation. It can still produce 4,000 units and transfer to Dept. Q as it has a surplus capacity.

In case of Dept. Q, as it has a bottleneck operation, there is a possibility of opportunity cost.

Cost of materials used for defective units (5,000 x 120) = ₹ 6,00,000

Add: Opportunity Cost (Contribution lost) (5,000 x 30) = **₹ 1,50,000**

Total cost of defectives **₹ 7,50,000**

Question 5

(a) *Sun Chemicals Ltd. operates a Division R that produces chemical compound 'R' usable in production of detergent soaps. Total installed capacity of Division R is 1,00,000 tonnes and company is operating at full capacity. Revenue and costs associated with compound R per tonne is as under:*

		₹ (per tonne)
Selling Price		*20,000*
Less Variable Cost	*14,000*	
Fixed costs (based on the Installed capacity)	*5,000*	*19,000*
Net Income		*1,000*

Sun Chemicals Ltd. has just acquired a small company RAC extractions Ltd. that manufactures branded soaps and decided to treat it as an independent profit centre and as a separate Division 'RS'. The new division RS is currently purchasing its requirement of 12,000 tonnes of Compound R per year in an open market at ₹ 20,000 per tonne less 15% quantity discount. Once acceptable inter divisional transfer price is worked out for both the divisions, it is likely to ask RS Division to source its annual requirement from Division R.

Required:

For (i) and (ii) below assume that Division R could sell all of its production of Compound R at the price of ₹ 20,000 per tonne.

(i) Only from the view point of financial considerations of each division, keeping the individual division's interests in the forefront, will there be any mutual agreeable transfer price? Support your answer with brief reasoning.

(ii) Assuming that Division R meets the open market procurement price of RS, what will be the effect on profit of Division R & Division RS and the Company as a whole.

For (iii) to (vi) below assume that the Division R could sell only 80,000 tonnes each year to outside customers at ₹ 20,000 per tonne:

(iii) Are the managers of the Division R and Division RS likely to agree to a transfer price for 12,000 tonnes of compound R? Why or why not?

(iv) Suppose the Division RS's outside suppliers reduced the price of compound R to ₹ 16,000, can the Division R accepts this as transfer price. What would be effect on overall profit of the company in this case?

(v) *If the Division R refuses to supply the compound R to Division RS at the price stated in point (iv) above should Division RS be required to purchase the compound R at the higher price from Division R only, for the overall interest of the company.*

(vi) *Disregarding the divisional independence, if Division RS is directed to purchase 12,000 tonnes of Compound R at ₹ 20,000 per tonne, what will be the effect on the profit of the Company as a whole? Consider the open market price suggested in point (iv) above.* ***(10 Marks)***

(b) *In the 3rd quarter of 2018-19 Modem Engineering Limited (MEL) had developed a new product that has a short life cycle. The product has a life cycle of 18,000 units. It was estimated that the first 15,000 units will be sold @ ₹ 800 each. Thereafter, during 'decline' stage of its life cycle, the selling price will have to be reduced. The product is produced in batches.*

Cost and other details applicable throughout the product's life cycle are as follows:

No. of units per batch	*100 units*
Labour cost	*₹ 150 per hour*
Other variable costs (Including material cost)	*₹ 25,000 per batch*
Total fixed cost for the product	*₹ 5,80,000*
Labour hours taken to produce the first batch	*400 hours*

The product enjoyed 90 per cent learning curve until 128th batch had been produced. Production of batches beyond 128th batch will have no learning effect and requires same amount of labour time as required for the 128th batch.

Till March 31, 2021, MEL had produced and sold 15,000 units at ₹ 800 each. It is ascertained that total labour hours taken for production of·127 batches and 128 batches are 24,327 hours and 24,489 hours respectively.

Required:

Calculate the selling price per unit for 3,000 units to be sold in decline stage so as to earn a total life cycle profit of ₹ 36,00,000 from the product. ***(6 Marks)***

Answer

(a) (i) From the details given in the problem it can be understood that there is no idle capacity in Division-R and all of its production could be sold in the open market at the rate of ₹20,000 per tonne. If any transfer is to be made to 'Division-RS', it would directly reduce its outside sale. So the transfer price could be quoted by Division R would be:

Transfer Price = Variable Cost + (Total Contribution on lost sales/No. of units transferred)

= 14,000 + [(20,000 – 14,000)x 12,000]/12,000

= 14,000 + 6,000 = ₹20,000/-

Therefore, Division R would show reluctance to transfer the compound R at a price lesser than ₹20,000 per tonne.

In Case of Division RS, it can buy its requirements from open market less 15% quantity discount which means @ ₹17,000/- (₹20,000 – 15%). Therefore, this Division would be unwilling to pay more than ₹17,000/- per tonne.

From the above it can be said that the requirements of two divisions are contrary to each other. Division RS not willing to pay more than ₹17,000/- and Division R is unwilling to accept less than ₹20,000/- per tonne. Therefore, there can be no mutually agreeable transfer price between Division R and Division RS.

(ii) Division R is meeting the open market procurement price of Division RS means it should transfer the compound at the rate of ₹17,000/- per tonne. This will give a loss of profit of ₹3,000/- per tonne to Division R. Therefore, the total loss to Division R = (3,000 x 12,000 tonnes) = ₹360 lakhs

Division RS will not lose anything as it is getting the component from R at the price at which it is purchasing in the open market. However, overall profitability of the company will reduce by ₹360 lakhs.

(iii) In the given case there seems to be an idle capacity beyond 80,000 tonnes for Division R. In this case transfer could be at the variable cost to Division R which is ₹14,000/- per tonne. Division RS would happily accept this offer as it is getting the compound below the price of ₹17,000/- charged in the open market. Thus, price range of ₹14,000/- to ₹17,000/- is acceptable to both the divisional managers.

(iv) New Price offered to Division RS = ₹ 16,000 per tonne

Variable Cost to Division R = ₹ 14,000 per tonne

Therefore, Contribution Margin per tonne = ₹ 2,000 per tonne

Total Contribution Margin = (2,000 x 12,000 units) = ₹240 lakhs

Therefore profit to Division R and to the company as a whole = **₹240 lakhs**

In this case, Division RS is indifferent as anyway it is getting the compound in the open market for the same price of ₹16,000/- per tonne.

(v) No, Division RS is not obligated to purchase from Division R. It is free to go to outside supplier to get the best advantage. Even though it may leave Division R with some idle capacity, Division RS should **not be forced to buy** at a higher price, in the overall interest of the company as it may undermine the authority of division.

(vi) Increase in Profit (p.u.) to Division R = Selling Price – V. Cost = 20,000 – 14,000 = ₹6,000/-

Total increase in Profit to Division R = ₹6,000 x 12,000 = **₹720 lakhs.**

Decrease in profit (p.u.) to Division RS = Internal Transfer price – Outside Purchase Price

= ₹20,000 – ₹16,000 = ₹4,000/-

Total decrease in Profit (Loss) to Division RS = ₹4,000 x 12,000 = **₹480 lakhs**

Therefore, profit of the company as a whole = Profit to Division R – Loss to Division RS

= 720 lakhs – 480 lakhs = **₹240 lakhs**

(b) Computation of Selling Price under life cycle costing using Learning Curve:

Total labour hours taken for 128 batches = 24,489

Total labour hours taken for 127 batches = 24,327

Hours taken for 128th batch **= 162 hours**

Total life cycle output of the new product is 18,000 units. As the product is to be produced in batches of 100 units, all together there will be 180 batches of production.

Labour hours of 128 batches	= 24,489
Labour hours for 129 to 180 batches in which there is no learning effect (52 batches @ 162 hours)	= 8,424
Therefore, Total Labour Hours for 180 batches	= **32,913**
Labour Cost for 180 batches (32,913 x ₹150)	= ₹ 49,36,950
Other Variable Cost (180 batches @ ₹25,000)	= ₹ 45,00,000
Total Fixed Cost	= ₹ 5,80,000
Total Cost	**₹1,00,16,950**
Add: Total lifetime profit required	₹ 36,00,000
Total Sales required to earn the desired profit	**₹ 1,36,16,950**
Less: Expected Sales from first 15,000 units (15,000 x ₹800)	₹ 1,20,00,000

Total sales required from the remaining 3,000 units = **₹16,16,950**

Selling price (p.u.) to be sold in decline stage = ₹16,16,950/3,000 = **₹ 538.98/-**

Question 6

(a) Shyam Food Products (SFP) Ltd. manufactures protein shakes under the brand name 'Health Plus' and 'Body Plus'. It has a fully automated production system and the product cost does not include direct labour cost. The company is a market leader in terms of market share and price of the products. It has its own client base ready to pay the price but would

not compromise with quality. SFP Ltd. has implemented a stringent quality control system and it carries out the following four activities in relation to its products:

- *Inspection of incoming raw materials received in batches.*
- *Processing of products in batches.*
- *Quality control inspection of finished products - first during the production process for each batch processed and again at the time of despatch for each batch of products despatched to customers to ensure product quality control.*
- *Despatch of finished products to customers in batches.*

Recently, an FMCG Conglomerate stepped into this business and have started aggressive advertisement campaigning and are about to launch their products within a few months. SFP Ltd. is a cash rich company. It apprehends that the competitors may adopt a penetrating pricing policy and offer lower prices for the same product quality and pose a growing threat to the company.

The Chief Executive Officer (CEO) and the Management Accountant both believe that the company would no longer be in a position to dictate the price of the products. Rather, it would be a market driven price and in order to keep the profit intact, the company will have to adopt target costing approach. SFP Ltd. took an initiative to know the accurate cost of the products using Activity Based Costing (ABC) approach.

The following information relates to the batch size, costs involved for the activities carried out and other relevant information for the products of the company for the quarter ending on 31st March, 2021:

Particulars	***Health Plus***	***Body Plus***	***Cost (₹)***
Raw materials consumed	*40,000 kg @ ₹144 per kg*	*50,000 kg @ ₹180 per kg*	*1,47,60,000*
Output discarded in quality control test at the end of production process	*10%*	*20%*	*-*
Batch size:			
Inspection of raw materials	*2,000 kgs*	*2,500 kgs*	*1,70,000*
Processing	*400 kgs*	*1,000 kgs*	*1,87,500*
Dispatch	*400 kgs*	*500 kgs*	*2,55,000*
Product quality control inspection	*-*	*-*	*6,00,000*

Required:

(i) Calculate the cost driver rate for each of the four activities.

(ii) *Calculate cost per kilogram of 'Health Plus' and 'Body Plus' using activity based costing.*

(iii) *Advise how the company can remain competitive and keep its market share intact.*

(8 Marks)

(b) *PQR Ltd. manufactures two products P and Q using two basic raw materials AX-25 and BZ-50. The current pattern of sales of P and Q is in the ratio of 5:6 respectively. The relevant data is as under:*

	P	***Q***
Expected selling price per unit	*₹ 750*	*₹ 500*
Material required (per unit/kg)		
AX-25	*1.5 kg*	*1.2 kg*
BZ-50	*0.6kg*	*0.5 kg*
Labour @ ₹ 80 per hour	*₹ 96*	*₹ 72*
Variable overheads per unit	*₹ 64*	*₹ 46*

Fixed overheads are ₹ 27,12,500 per month and the company desires a profit of 8% on sales.

The price of material AX- 25 and BZ-50 is ₹ 160 per unit and ₹ 100 per unit respectively. Opening inventory of material and finished goods as on 01.06.2021 is as under:

AX-25	***BZ-50***	***P***	***Q***
8,000 kg	*3,750 kg*	*3,000 units*	*4,000 units*

The company is introducing a new system of inventory control which should reduce stock levels. The company forecasted closing stock of materials and finished goods at 70% and 75% of the opening stocks respectively. Normal wastage of material during the production is 4% in case of material AX-25.

You are required to prepare the following budgets for June 2021:

(i) *Sales budget in quantity and value.*

(ii) *Production budget in quantity.*

(iii) *Material usage budget in quantity and value.*

(iv) *Material purchase budget in quantity.* ***(8 Marks)***

Answer

(a) (i) Calculation of cost driver rates:

Activity	Number of activities		Total Activity	Total Cost (₹)	Cost Driver Rate (₹)
	Health Plus	Body Plus			
Inspection of Raw materials	40,000/2,000 = **20 inspections**	50,000/2,500 = **20 inspections**	40 inspections	1,70,000	1,70,000/40 = **4,250**
Processing	40,000/400 = **100 batches**	50,000/1,000 = **50 batches**	150 batches	1,87,500	1,87,500/150 = **1,250**
Quality Control inspection	Processing: 100 batches Shipment: (40,000 – 10%)/400 =90 batches Total=100+90=**190 batches**	Processing: 50 batches Shipment: (50,000 – 20%)/500 =80 batches Total = 50 + 80 = **130 batches**	190+130= 320 batches	6,00,000	6,00,000/320 = **1,875**
Despatch	**90** Shipments	**80** Shipments	170 Shipments	2,55,000	2,55,000/170 = **1,500**

(ii) Calculation of Overhead cost under Activity Based Costing:

Particulars	Health Plus (₹)	Body Plus (₹)
Inspection of Raw Materials	(20x₹4,250)= **85,000**	(20x₹4,250)= **85,000**
Processing	(100x₹1,250) = **1,25,000**	(50x₹1,250)= **62,500**
Quality Control Inspection	(190x₹1,875) = **3,56,250**	(130x₹1,875)= **2,43,750**
Despatch	(90 x ₹1,500) = **1,35,000**	(80x₹1,500)= **1,20,000**
Total	7,01,250	5,11,250

Calculation of cost per kilogram of 'Health Plus' and 'Body Plus':

Particulars	Health Plus (₹)	Body Plus (₹)
Raw materials	144x(100/90) = 160.00 *	180x(100/80) = 225.00 *
Overhead cost	7,01,250/36,000 = 19.48 *	5,11,250/40,000 = 12.78 *
Total	**179.48**	**237.78**

ALTERNATIVE PRESENTATION

Particulars	Health Plus (₹)	Body Plus (₹)
Raw Materials consumed	57,60,000	90,00,000
Total Overhead costs	7,01,250	5,11,250
Total costs	64,61,250	95,11,250
Total output (in Kgs)	36,000	40,000
Cost per Kilogram of output (Total Cost/Output)	**179.48**	**237.78**

(iii) Points to be considered to remain competitive in the market:

- Output discarded in quality control test at the end of the production process is 10% and 20% respectively for Health Plus and Body Plus. This is a considerable amount of loss, need to be reduced which in turn would substantially reduce the cost per unit of both the products.
- The company must introduce necessary improvements in the automated production system to identify the root cause and to reduce such a high percentage of production loss.
- Company should undertake measures for cost control and cost reduction through value analysis.

(b) (i) Sales Budget (in units)

Particulars	Products	
	P	Q
Sales (units)	5x	6x
Selling Price p.u.	750	500
Less: Variable Cost p.u.		
Material:		
AX - 25 @ ₹160 per kg	240	192
BZ - 50 @ ₹100 per kg	60	50
Labour	96	72
Variable overheads	64	46
Contribution p.u.	290	140
Total Contribution	1450x	840x

Total contribution = Fixed cost + Profit

(1450x + 840x) = 27,12,500 + 0.08(750*5x + 500*6x)

2290x = 27,12,500 + 540x ==> 2290x – 540x = 27,12,500

x = 27,12,500/1750 ➔ x = 1,550 units.

Therefore, sales quantity of P = 1,550 x 5 = **7,750 units**

sales quantity of Q = 1,550 x 6 = **9,300 units**

Sales budget (in ₹)

Product	Units sold	Price p.u. (₹)	Total sales (₹)
P	7,750	750	58,12,500
Q	9,300	500	46,50,000

(ii) Production Budget (in units)

Particulars	P (Units)	Q (Units)
Sales	7,750	9,300
Add: Closing Stock – 75% of Opening stock	2,250	3,000
	10,000	12,300
Less: Opening Stock	3,000	4,000
Production	**7,000**	**8,300**

(iii) Material Usage Budget in quantity and value

	AX-25	BZ-50
Material Usage-P	10,500 Kg. (**1.5 Kg*.** x 7,000 units)	4,200 Kg. (0.6 Kg. x 7,000 units)
Material Usage-Q	9,960 Kg. (**1.2 Kg.*** x 8,300 units)	4,150 Kg. (0.5 Kg. x 8,300 units)
Total Usage	**20,460 Kg.**	**8,350 Kg.**
Price per Kg.	160	100
Total Value	**₹ 32,73,600**	**₹ 8,35,000**

In the question it has been given that price of material AX-25 and BZ-50 is ₹ 160 per unit and ₹100 per unit respectively. These two ***per unit* figures** has been considered as ***per Kg.* figures** for both products.

*Gross requirement (Inclusive of wastage)

(iv) Material Purchase Budget in Quantity

	AX-25	BZ-50
Material Usage	20,460 Kg.	8,350 Kg.

Add: Closing Inventory (70% of Opening Inventory)	5,600 Kg.	2,625 Kg.
Less: Opening Inventory	8,000 Kg.	3,750 Kg.
Production	**18,060 Kg.**	**7,225 Kg.**

ALTERNATIVE

In this alternative, material requirement given in the problem has been considered as "net" requirement (i.e., exclusive of waste)

Statement Showing Contribution from Product P and Q

	Product P	**Product Q**
Selling Price	750	500
Less: Material Ax-25 **(gross requirement)**	250 **(1.50 kg. x ₹ 160)/0.96**	200 **(1.20 kg. x ₹ 160)/0.96**
Less: Material BZ-50	60 (0.60 kg. x ₹ 100)	50 (0.50 kg. x ₹ 100)
Less: Labour	96	72
Less: Variable Overhead	64	46
Contribution	**280**	**132**

Sales Ratio (P:Q)= 5:6

Let Sales of Product P = 5K, then Sales of Product Q= 6K

Profit =8% of Sales

5K x 280 + 6K x 132 -27,12,500 = (5K x 750 + 6K x 500) x 8%

K= 1,642 (appx.)

(i) Sales Budget

	Product P	**Product Q**
Sales Quantity	**8,210 units** (1,642x 5)	**9,852 units** (1,642 x 6)
Sales Value	**₹ 61,57,500** (8,210 x ₹750)	**₹ 49,26,000** (9,852 x 500)

(ii) Production Budget

	Product P (units)	**Product Q (units)**
Sales Quantity	8,210 units	9,852 units

Add: Closing Inventory (75% of Opening Inventory)	2,250 units (3,000 x 75%)	3,000 units (4,000 x 75%)
Less: Opening Inventory	3,000	4,000
Production	**7,460**	**8,852**

(iii) Material Usage Budget

	AX-25	BZ-50
Material Usage-P	11,657 Kg. **(1.5 Kg. x 7,460 units)/0.96**	4,476 Kg. (0.6 Kg. x 7,460 units)
Material Usage-Q	11,065 Kg. **(1.2 Kg. x 8,852 units)/0.96**	4,426 Kg. (0.5 Kg. x 8,852 units)
Total Usage	**22,722 Kg.**	**8,902 Kg.**
Price per Kg.	160	100
Total Value	**₹ 36,35,520**	**₹ 8,90,200**

(iv) Material Purchase Budget in Quantity

	AX-25	BZ-50
Material Usage	22,722 Kg.	8,902 Kg.
Add: Closing Inventory (70% of Opening Inventory)	5,600 Kg.	2,625 Kg.
Less: Opening Inventory	8,000 Kg.	3,750 Kg.
Production	**20,322 Kg.**	**7,777 Kg.**

Question 7

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

(a) State with brief reasons whether the following statements are valid or invalid in the context of pricing decisions:

(i) Under perfect competition, a firm is a price setter.

(ii) Price of a product set below the perceived value but above the cost of sales give incentives to the seller only.

(iii) Charging lower rate for front seats than the back seats in cinema theatre is an example of price discrimination based on place.

(iv) When demand of the product is elastic to price, skimming pricing strategy is adopted.

(b) State with brief reasons the validity of the following statement in connection with PERT and CPM:

(i) Two activities have common predecessor and successor activities. So, they can have common initial and final nodes.

(ii) The difference between the earliest and latest start time for the activity is termed as independent float.

(iii) The optimum duration of a project is the minimum time in which it can be completed.

(iv) When dummy activities are inserted in a network diagram unnecessarily, this type of error is called dangling.

(c) (i) "Assignment problem is special case of transportation problem, it can also be solved by transportation methods" explain the statement briefly.

(ii) In an assignment problem to assign jobs to men to minimize the time taken, suppose that one man does not know how to do a particular job, how will you eliminate this allocation from the solution?

(d) Discuss the limitations of inter firm comparison.

(e) Some statements are given below. Identify the type of cost and state whether it is relevant/non- relevant in decision making:

(i) A company has paid ₹ 8 lakhs to a marketing research company to find out expected – demand of the newly developed product of the company.

(ii) Company invested ₹ 30 lakhs in a project. Company could have earned ₹ 2.40 lakh as interest by keeping amount as Fixed deposit with bank.

(iii) Company has paid ₹ 2 lakh as rent for a factory which is temporarily closed for four months.

(iv) Company has paid commission of ₹ 4.50 lakh @ 2% on sales to the salesmen for achieving sales beyond the target sale of ₹ 25 lakh per month per salesman.

(4 x 4 = 16 Marks)

Answer

(a) (i) Invalid: Under perfect competition, firm has no pricing policy of its own as the sellers are price takers and sells as much as they are capable of selling at the prevailing market price.

(ii) Invalid: perceived value is the value that consumer understands the product deliver to him. It is the price of a product that a consumer is willing to spend to have the product. Price of a product set below the perceived value but above the cost of sales give incentives to both buyers and sellers.

(iii) **Valid:** here price discrimination is made based on the location/place of the seat in the same cinema theatre.

(iv) **Invalid:** when demand of the product is elastic to price that is the demand of the product increases when price is low; skimming pricing strategy is not adopted. It is adopted when demand is likely to be inelastic.

(b) **(i)** **Invalid:** No two activities can have same initial and final nodes. These are called parallel activities, and require the use of a dummy activity.

(ii) **Invalid:** The difference between the earliest and the latest start time for the activity is termed as Total Float.

(iii) **Invalid:** Optimum duration is the time period in which the total cost of project is minimum.

(iv) **Invalid:** When dummy activities are inserted in a network diagram unnecessarily, this type of error is called redundancy.

(c) **(i)** The assignment problem is special case of transportation problem; it can also be solved by transportation method. But the solution obtained by applying this method would be severely degenerate. This is because the optimality test in the transportation method requires that there must be m+n-1 allocations/assignments. But due to the special structure of assignment problem of order n × n, any solution cannot have more than n assignments. Thus, the assignment problem is naturally degenerate. In order to remove degeneracy, n-1* number of dummy allocations will be required in order to proceed with the transportation method. Thus, the problem of degeneracy at each solution makes the transportation method computationally inefficient for solving an assignment problem.

(*) $\underline{m+n-1} - n \Rightarrow \underline{n+n-1} - n \Rightarrow \underline{2n-1} - n \Rightarrow \underline{n-1}$

(ii) In an assignment minimization problem, if one task cannot be assigned to one person, introduce a prohibitively large cost for that allocation, say M, where M has a high value. Then, while doing the row minimization and column minimization, this allocation will automatically get eliminated.

(d) **Limitations of inter firm comparison:**

- Top management feels that secrecy will be lost.
- Middle management is usually not convinced, with the utility of such a comparison.
- In the absence of a suitable cost accounting system, the figures supplied may not be reliable for the purpose of comparison.
- Suitable basis for comparison may not be available.

(e)

S. No.	Type of Cost	Relevant/Non-relevant
(i)	Sunk cost	Non-relevant

(ii)	Opportunity cost	Relevant
(iii)	Committed cost/ Shut down cost	Non-relevant
(iv)	Out of pocket cost	Relevant