

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 is to be distributed along with this question paper.

Question 1

- (a) New Ltd. Plans to completely manufacture a single product Z., whose selling price and variable manufacturing costs will be ₹ 100 per unit and ₹ 80 per unit respectively. If the complete production is done at its own factory, fixed machining costs will be ₹ 3,62,000 and fixed administration and selling overheads will be ₹ 30,000 for the production period.

Alternatively, the product can be finished outside by sub contracting the machining operations at ₹ 10 per unit, but this will entail an increase in the fixed administration overheads by ₹ 1,20,000 while fully avoiding the machining cost of ₹ 3,62,000

Based on the above figures and assuming a production capacity of 30,000 units for the production period, advise with relevant supporting figures, from a financial perspective, for what volumes of market demand will:

- (i) a manufacture be recommended at all ?
- (ii) a fully in-house production be recommended?
- (iii) the sub contracting option be recommended ? (5 Marks)

- (b) Pigments Ltd. is a chemical factory producing joint product s J, K and L at a joint cost of production of ₹ 9, 60,000. The sales are:

J 60,000 units ₹ at 5 per unit,

K 20,000 units at ₹ 20 per unit and

L 40,000 units at ₹ 10 per unit

The company seeks you advice regarding the following options available:

Option I: After the joint process, all of L can be further processed to make 36,000 units of M, at an additional processing cost of ₹ 1,80,000 and M can be sold at ₹ 18 per unit.

Option II: the facilities used to convert L to M may be used to make 7000 units of an additional product A, with a different raw material input. A can be made at an additional variable manufacturing cost of ₹ 12 per unit and will fetch ₹ 30 as the selling price, but the company will have to offer one unit of J as a free gift for each unit of A sold.

Evaluate the proposals using the incremental cost approach. (5 Marks)

- (c) State any 5 limitations of the assumptions of PERT and CPM (5 Marks)

(d) Classify the following items under appropriate categories of quality costs viz. Prevention Costs, appraisal Cost, Internal Failure Costs and External Failure costs:

- (i) Rework
- (ii) Disposal of scrap
- (iii) Warranty Repairs
- (iv) Revenue loss
- (v) Repair to manufacturing equipments
- (vi) Discount on defective sale
- (vii) Raw material inspection
- (viii) Finished product inspection
- (ix) Establishment of quality circles
- (x) Packaging inspection

(5 Marks)

Answers

(a)

Options		
Details	Manufacturing	Sub Contract
	Amount (₹)	Amount (₹)
Selling price	100	100
Variable Cost	80	90
Contribution	20	10
Fixed Cost	3,92,000	1,50,000
BEP (units)	19,600	15,000

Point of Indifference = level of production where both options will have same outcome.

It can be calculated as :

Difference in Fixed cost = ₹ (3,92,000 – 1,50,000) = ₹ 2,42,000

Difference in contribution per unit = ₹ 10

Point of indifference = 2,42,000 / 10 = 24,200 units.

It may be calculated in alternative way.

Indifference Point (x): $(20x - 392000) = (10x - 150000)$

$10x = 242000$

$X = 24200$

- (i) If Market demand is above 15000 : manufacture is recommended
- (ii) For Demand 24201 to 30000 units : Manufacture fully in-house.
- (iii) For Demand 15000 to 24200 units : Sub-contract

(b) Working Notes:

Particulars	Option – I Process L to M	Option – II Sell new product A
	Amount (₹)	Amount (₹)
Sale of Product M	648,000	
Sale of Product A		210000
(Less: Revenue lost on Product L)	400,000	
(Less: Revenue lost on Product J)		35000
Less: Additional Cost	180,000	84000
Incremental Profit	68000	91000
Decision : Option II is better by ₹ 23000		

(c) Limitations of the assumption of PERT and CPM

- (i) Beta distribution may not always be applicable
- (ii) The formulae for expected duration and standard deviation are simplification. In certain cases, errors due to these have been found up to 33 %
- (iii) The above errors may get compounded or may cancel each other
- (iv) Activities are assumed to be independent. But the limitations on the resources may not justify the assumption.
- (v) It may not always be possible to sort out completely identifiable activities and to state where they begin and where they end
- (vi) If there exist alternatives in outcome, they need to be incorporated by way of a decision tree analysis.
- (vii) Time estimates have a subjective element and to this extent, techniques could be weak. Contractors can manipulate and underestimate time in cost plus contract bids. In incentive contracts, overestimation is likely.
- (viii) Cost-time tradeoffs / cost curve slopes are subjective and even experts may be widely off the mark even after honest deliberations

- (d) i Rework Internal Failure
- ii Disposal of Scrap Internal Failure
- iii Warranty Repairs External Failure

iv	Revenue Loss	External Failure
v	Repairs to Manufacturing Equipment	Internal Failure
vi	Discount on Defective Sales	External Failure
vii	Raw Material Inspection	Prevention Cost
viii	Finished Product Inspection	Appraisal Cost
ix	Establishment of Quality Circles	Prevention Cost
X	Packaging Inspection	Appraisal Cost

Question 2.

- (a) The budget and actual operating data for 2010-11 pertaining to 4 products in a store are given below: (10 Marks)

Product	Budgeted data for 2010-11			Actual operating results in 2010-11		
	Gallons	Selling price (₹ per gallon)	Variable costs (₹ per gallon)	Gallons	Selling price (₹ per gallon)	Variable costs (₹ per gallon)
V	2,50,000	1.2	0.5	1,80,000	1.00	0.45
C	3,00,000	1.5	0.6	2,70,000	1.35	0.50
S	2,00,000	1.8	0.7	3,30,000	2.00	0.75
A	50,000	2.5	1.00	1,80,000	3.00	1.20

You are required to compute for the individual products and in total:

- (i) the sales margin price variance
(ii) the sales margin mix variance and
(iii) the sales margin volume variance

Indicate whether the variances are favorable (F) or unfavorable (A or U) (10 Marks)

- (b) A city corporation has decided to carry out road repairs on 4 main roads in the city.

The Government has agreed to make a special grant of ₹ 50 lacs towards the cost with the condition that the repairs should be carried out at lowest cost. Five contractors have sent their bids. Only road will be awarded to one contractor. The bids are given below:

	Road	Cost of Repairs (₹ in lacs)			
		R ₁	R ₂	R ₃	R ₃
Contractors	C ₁	9	14	19	15
	C ₂	7	17	20	19
	C ₃	9	18	21	18
	C ₃	10	12	18	19
	C ₄	10	15	21	16

You are informed that C_2 should get R_1 and C_4 should get R_2 to minimize costs.

- (i) What is the minimum cost allocation?
- (ii) How much is the minimum discount that the eliminated contractor should offer for meriting a contract?
- (iii) Independent of (ii) above, if the corporation can negotiate to get a uniform discount rate from each contractor, what is the minimum rate of discount so that the cost is within the grant amount? (6 Marks)

Answer

(a) Working Notes:

Product	Budget Margin (BM)		Actual Margin (AM)	
	Budgeted Price – Budgeted Variable Cost		Actual Price – Budgeted Variable Cost	
V	1.2 – 0.5	= 0.7	1 – 0.5	= 0.5
C	1.5 – 0.6	= 0.9	1.35 – 0.6	= 0.75
S	1.8 – 0.7	= 1.1	2.0 – 0.7	= 1.3
A	2.5 – 1.0	= 1.5	3.0 – 1.0	= 2.0
	Actual Quantity x Actual Margin (1)		Actual Quantity x Budgeted Margin (2)	
V	1,80,000 x 0.5	= 90,000	1,80,000 x 0.7	= 1,26,000
C	2,70,000 x 0.75	= 2,02,500	2,70,000 x 0.9	= 2,43,000
S	3,30,000 x 1.3	= 4,29,000	3,30,000 x 1.1	= 3,63,000
A	1,80,000 x 2.0	= 3,60,000	1,80,000 x 1.5	= 2,70,000
	9,60,000	= 10,81,500	9,60,000	= 10,02,000
	Actual Qty in Budgeted mix x Budgeted Margin (3)		Budgeted Quantity x Budgeted Margin (4)	
V	3,00,000 x 0.7	= 2,10,000	2,50,000 x 0.7	= 1,75,000
C	3,60,000 x 0.9	= 3,24,000	3,00,000 x 0.9	= 2,70,000
S	2,40,000 x 1.1	= 2,64,000	2,00,000 x 1.1	= 2,20,000
A	60,000 x 1.5	= 90,000	50,000 x 1.5	= 75,000
	9,60,000	8,88,000	8,00,000	= 7,40,000
	Sales Margin – Price Variance (5) = (1) – (2)	Sales Margin Mix Variance (6) = (2) – (3)	Sales Margin Volume Variance (7) = (2) – (4)	
V	36,000 (A)	84,000 (A)	49,000 (A)	
C	40,500 (A)	81,000 (A)	27,000 (A)	
S	66,000 (F)	99,000 (F)	1,43,000 (F)	
A	90,000 (F)	1,80,000 (F)	1,95,000 (F)	
	79,500 (F)	1,14,000 (F)	2,62,000 (F)	

- (b) (i) There are 5 rows and 4 columns hence insert a dummy column R_5 .
- C_2 has been allocated to R_1
 - C_4 has been allocated to R_2 . Hence the assignment is restricted to

	R_3	R_4	R_5
C_1	19	15	0
C_3	21	18	0
C_5	21	16	0

Column Minimum

	R_3	R_4	R_5
C_1	0	0	0
C_3	2	3	0
C_5	2	1	0

	R_3	R_4	R_5
C_1	0	0	1
C_3	1	2	0
C_5	1	0	0

Hence C_1 has been allotted to R_3 , C_3 to R_5 and C_5 to R_4 .

Hence the Minimum cost is = $7+12+19+16+0 = 54$ Lacs

- (ii) C_3 should reduce 2 lacs for R_1 , 6 lacs for R_2 , 2 lacs for R_3 and 2 lacs for R_4

Minimum Discount = 2 Lacs for any of R_1 , R_3 , R_4

- (iii) Minimum rate of Discount $(54-50) = 4/54 = 7.41\%$

Question 3

- (a) PQ Ltd, makes two products P and Q, which are similar products with slight difference in dimensions, but use the same manufacturing processes and facilities. P{production may be made interchangeably after altering machine set-up. Production time is the same for both products. The cost structure is as follows:

(Figures ₹ per unit)	P	Q
Selling Price	100	120
Variable manufacturing cost (directly linked to units produced)	45	50

Contribution	55	70
Fixed manufacturing cost	10	10
Profit	45	60

Fixed cost per unit has been calculated based on the total practical capacity of 20,000 units per annum (which is either P or Q both put together). Market demand is expected to be the deciding factor regarding the product mix for the next 2 years. The company does not stock inventory of finished goods. The company wished to know whether ABC system is to be set up at a cost of ₹ 10,000 per month for the purpose of tracking and recording the fixed overhead costs for allocation to products.

Support your advice with appropriate reasons. (6 Marks)

Independent of the above, if you are told to assume that fixed costs stated above, consist of a non-cash component of depreciation to plant at 90,000 for the year, will you advice change? Explain. (2 Marks)

(b) In a company, division A makes product A and Division B makes product B.

One unit of A needs one unit of B as input. State the unit transfer price to be adapted by the transferring Division A to B in each of the following independent situations:

- There is a ready market for A. There are no constraints for production or demand for A and A does not incur any external selling cost.
- Supply is more than demand for A. External market resorts to distress price for A and this is expected to last for a temporary period. The product cannot be stocked until better times.
- Product A is highly specialized. Internal specifications are too many that B has to only buy from A.
- A has excess capacity. It can transfer any quantity to B. Goal congruence is to be achieved.
- A has no spare capacity, has adequate demand in a competitive market.
- A has no spare capacity and has adequate demand in a competitive market. But on units transferred to B, it incurs ₹ 10 per unit as additional transport cost and ₹ 10,000 as fixed expenses irrespective of the number of units transferred.

(8 Marks)

Answer

(a) Working Notes

#	Data	Reasoning	Decision
i.	Similar Products	OH Cost based on production units is appropriate. ABC will	ABC system not required for OH

	Similar Production Resources	also yield identical results	allocation
ii	Present OH Cost = 10/u. Proposed Increase due to ABC system : $120000/20000 = 6/u$	Current OH cost of 10/u will increase by 6 per unit due to installing ABC system (60% increase)	For allocation purpose, ABC not justified
iii.	Both have +ive contribution / u. Market demand determines the mix	OH allocation has no role in decision making	No need for ABC System
iv.	For the purpose of OH allocation, ABC need not be installed. However, if the fixed overheads of ₹ 2,00,000 are analysed by activity and thereby a saving of at least ₹ 1,20,000 be expected (which is the cost of installing ABC system), then, ABC system may be installed		
v.	For the non cash component of depn = 90,000 , FC that can be saved is a maximum of 1,10,000 (2,00,000 – 90,000). Hence, this is clearly less than ABC cost installation. Hence <u>do not install ABC System</u>		

(b) Transfer Price

- i) Market Price = Transfer price
- ii) For any quantity that the market can absorb, Price offered by B or Market price whichever is higher
For quantity that the market can no longer absorb, any price that B may offer
- iii) Maximum Transfer price = Total Cost + Profit subject to maxim price B can pay to keep its ultimate product profitable.
Minimum transfer price = variable cost
- iv) Transfer Price = Variable Cost to A
- v) Transfer price = Either Market Price or Variable Cost + Opportunity Cost of diverting market sale
- vi) Transfer price = Variable Cost + Opportunity Cost + specific cost + (fixed cost/units transferred)
Transfer Price/unit = (Market Price + 10) + (10,000/units transferred)
The question has an error. It says “one unit of A needs one unit of B”. Hence students can assume B transfers to A. Then, considering each sub division independently,

- i) B will offer A at market price of B less any avoidable selling expenses on units transferred to A.
- ii) A will stop buying from B since stock already exists.
- iii) Maximum Transfer price = Total Cost + Profit subject to maximum price B can pay to keep its ultimate product profitable.
Minimum transfer price = variable cost
- iv) Transfer Price = Variable Cost to A
- v) A will pay up to market price of B, less any avoidable selling expenses for transfers to A
- vi) Transfer price = Variable Cost + Opportunity Cost + specific cost + (fixed cost/units transferred)

$$\text{Transfer Price/unit} = (\text{Market Price} + 10) + (10,000/\text{units transferred})$$

Question 4

- (a) Alfa Mills prepared the following budget for its production department for 2010-11 for 12,000 units of production.

	₹
Raw Material @ ₹ 3 per unit	36,000
Labour 2 hours/unit @ ₹ 2.5 per hour	60,000
Production overheads:	
Power (variable)	3000
Repairs (variable)	1500
Indirect labour (80% variable)	2400
Factory Rent (Fixed)	3600
Factory Insurance (Fixed)	1800
Other Manufacturing Expenses (50% variable)	600
Total Production Cost	1,08,900

You are required to present the flexible budget classified under fixed and variable costs for

- (i) Production of 10,000 units
- (ii) Production of 15,000 units, for which raw material price increases by 10% for the entire quantity and labour rate increases by ₹ 0.5 per hour for the full direct labour hours.

(8 Marks)

- (b) Happy Holidays company contracts to take children on excursion trips Relevant information for a proposed excursion trip is given below:

Revenue per trip per child	4000
Expenses that have to be incurred:	
Train fare per child per trip	1700
Meals per child per trip	300
Craft Materials per child per trip	600
Room rent per trip (4 children can be accommodated in a room)	760
Local Transport at picnic spots (per vehicle) (each vehicle can seat 6 children excluding the driver)	1200

Fixed costs that are required to be covered in a trip ₹ 5,18,130 .

Find the minimum number of children to cross the break-even point and start earning a profit.
(6 Marks)

Answer

(a)

Flexible Budget				
Item of Cost	10000 units		15000 units	
	Working	₹	Working	₹
Variable Costs				
Raw Material	3*10000	30,000	3*15000*1.1	49,500
Labour	2*2.5*10000	50,000	2*3*15000	90,000
Power	3000/12000*10000	2,500	3000/12000*15000	3,750
Repair	1500/12000*10000	1,250	1500/12000*15000	1,875
Indirect Labour – Variable	2400*80%/12000*10000	1,600	2400*80%/12000*15000	2,400
Other Mfg Cost – Variable	600*50%/12000*10000	250	600*50%/12000*15000	375
Sub-total variable costs		85600		147900
Fixed Costs				
Indirect Labour – Fixed	2400*20%	480	2400*20%	480
Other Mfg Cost – Fixed	600*50%	300	600*50%	300
Factory Rent		3,600		3,600

Factory Insurance		1,800		1,800
Sub-total fixed costs		6180		6180
Total Production Cost		91,780		154,080

(b)

Item Description	₹
Revenue per trip	4,000
Less: Variable Cost	
Train Fare	1,700
Meals per Child	300
Craft Materials	600
Total Variable Cost	2,600
Contribution per child	1,400

$$\text{Relevant Range} = \frac{5,18,130}{1010} = 513$$

Step Fixed Cost

Items	₹
Room Rent (760/4)	190
Transport Cost (1200/6)	200
Total Step Fixed Cost	390

$$\text{Net Contribution} = 1400 - 390 = ₹ 1010.$$

Details	Amount
Sales	4000
Variable Cost	-2600
Contribution	1400

At 513 Students

General Fixed Cost		518,130
Room Rent	129*760	98,040
Transportation	86*1200	103,200
Total Fixed Cost		719,370
Gross Contribution	513*1400	718,200
Loss		(1,170)

$$\text{BEP} = 513 + 1170/1400 = 513.83. \text{ Hence the Minimum Students will be 514}$$

Relevant Range for Earning Profit will be 514 to 516

Particulars	514	516
General Fixed Cost	518,130	518,130
Room Rent	98,040	98,040
Transportation	103,200	103,200
Total Fixed Cost	719,370	719,370
Gross Contribution	719,600	722,400
Profit	230	3,030

Question 5.

- (a) Quickcomp is a successful version of a software package that is widely used. Fastercomp is the next version, for which the development is complete and it is ready to be sold immediately in the market as budgeted. However, for Fastercomp, user manuals, training modules and diskettes have not yet been made, whereas, for the Quickcomp version, these are overstocked by 5,000 units. Release of Fastercomp will render the Quickcomp version not saleable.

The following information is provided:

	Quickcomp	Fastercomp
Selling price per unit ₹	14,000	14,000
Variable cost per unit ₹ (consisting of user manuals, training modules and diskettes)	1000	4000
Development Cost per unit ₹ (total cost of development spread over the expected sales quantity during the product's life-cycle)	7,000	10,000
Marketing/Administration Cost per unit ₹ (Fixed budgeted annual outflow divided by the expected sales quantity for each product for the year)	3500	4000
Total Costs per unit ₹	11,500	18,000
Operating Income per unit	2,500	1,000

From a purely financial perspective, the company wants your advice whether to delay the release of the new version by 2 months by when the inventory of the existing version would have sold out or to release the new version immediately. Support your advice with relevant figures. (6 Marks)

- (b) Given below is the relevant portion of the first iteration of a linear program under the simplex method, using the usual notations.

			X_1	X_2	X_1	X_2	X_3
Quantity	Basic Variable	Contribution Per unit	50	40	0	0	0
150	S_1	0	3	5	1	0	0
20	S_2	0	0	1	0	1	0
296	S_3	0	8	5	0	0	1

- (i) Write the initial liner program with the objective function and the in equations.
The following questions are to be answered independent of each other and based on the iteration given above:
- (ii) What is the opportunity cost of bringing one unit of x_1 into the solution?
- (iii) If we bring 4 units of x_1 into the solution, by how much will the basic variables changes?
- (iv) What will be the change in the value of the objective function if 4 units of x_2 are brought into the solution?
- (v) What will be the quantity of the incoming variable? (10 Marks)

Answer

(a)

Particulars	Quickcomp	Fastercomp	Remarks
Sale Price	14,000	19,000	Given
Less:			
Variable Cost	-	4,000	Quickcomp Variable Cost is Sunk cost
Development Cost	-	-	Sunk Cost
Marketing Cost	-	-	Sunk Cost
Profit	14,000	15,000	
Incremental Profit is ₹ 1000/- Unit.			
Better to Release Fastercomp now in order to get higher profit by ₹ 5000 x 1000 = 50 lacs.			

- (b) (i) Maximize $Z = 50x_1 + 40x_2$
Subject to
 $3x_1 + 5x_2 \leq 150$
 $x_2 \leq 20$
 $8x_1 + 5x_2 \leq 296$
 $x_1, x_2 \geq 0$
- (ii) Opportunity Cost of bringing one unit of x_1 into the solution is ₹ 40, (i.e. the contribution lost on not bringing one unit of the next best choice, which is x_2).

(iii)

Change in basic variable per unit of x_1	Change in basic variables for 4 units of x_1	Implication
3	12	S_1 will be reduced by 12
0	0	S_2 will not be impacted
8	32	S_3 will be reduced by 32 units if we bring 4 units of x_1 into the solution

- (iv) Objective function value will increase by $4 \times 40 = ₹ 160$ if we bring in 4 units of x_2 into the solution.
- (v) x_1 having highest contribution will be the incoming variable. Maximum no of units of x_1 that can come in = Maximum ratio, which is minimum of $(150/3, 20/0, 296/8)$ = Minimum of $(50, \infty, 37)$. Hence quantity of incoming variable x_1 is 37 units.

Question 6

- (a) The number of days of total float (TF), earliest start times (EST) and duration in days are given for some of the following activities.

Activity	TF	EST	Duration
1 – 2	0	0	5
1 – 3	0		
1 – 4	5		
2 – 4	0	4	
2 – 5	1		
3 – 6	2	12	
4 – 6	0	12	
5 – 7	3		
6 – 7		23	
6 – 8	2		
7 – 8	0	23	6
8 – 9		30	

- (i) Draw the network.
- (ii) List the paths with their corresponding durations and state when the project can be completed. (10 Marks)
- (b) State the pricing policy most suitable in each of the following independent situations:
- (i) The company makes original equipments and does defence contract work. There are other companies which also undertake such projects.

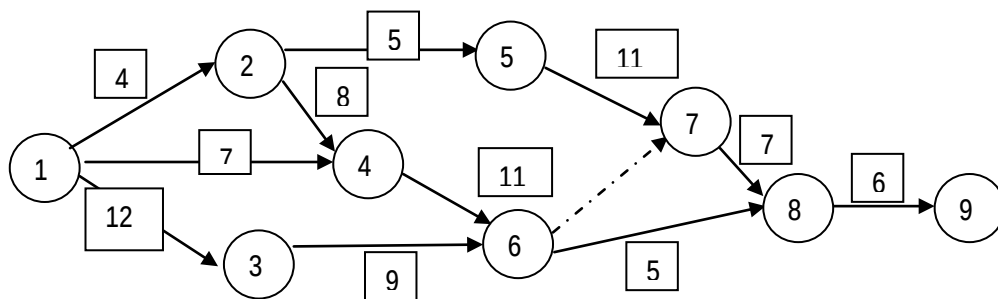
- (ii) The product made by a company is new to the market. It is expected to enjoy a long-term demand. Competition is expected very soon, since the product will be desirable to most customers.
- (iii) Stock of processed ready-to-eat product, whose shelf-life will soon be over in the next 2 months. The product is going to be discontinued.
- (iv) A company sells a homogeneous product in a highly competitive market.

(Candidates need to only write the pricing policy with the corresponding sub-division numbers of the questions. The situations need not be copied into the answer books) (4 Marks)

- (c) Two companies, H and L, have the same values for turnover and net profit and make a similar product. H has a higher P/V ratio than L. Which company will perform better when: (i) the market demand is high ? (ii) the market demand is low? (2 Marks)

Answer

(a)



Network Diagram: 6-7 dummy

6-8-9 and 7-8-9

1-2-5-7 and 1-2-4-6

1-4-6 and 1-3-6

Activity	Duration	Early Start	Late Start	Late Finish	Total Float
1-2	4	0	0	4	0
1-3	12	0	2	14	0
1-4	7	0	5	12	5
2-4	8	4	4	12	0
2-5	5	4	8	13	1
3-6	9	12	14	23	2

4-6	11	12	12	23	0
5-7	11	9	12	23	3
6-7	0	23	23	23	0
6-8	5	23	25	30	2
7-8	7	23	23	30	0
8-9	6	30	30	36	0

PATH	DURATION
1-2-5-7-8-9	32
1-2-4-6-7-8-9	36
1-2-4-6-8-9	34
1-4-6-7-8-9	31
1-4-6-8-9	29
1-3-6-7-8-9	34
1-3-6-8-9	32

- (b) (i) Sealed Bid Pricing
(ii) Penetration Pricing
(iii) Any price that the market will pay (even below variable cost any cash received)
(iv) Going rate pricing or market price
- (c) (i) In case Market Demand is High – Product H (Lower Variable Cost and Higher Fixed Cost)
(ii) In case Market Demand is Low – Product L

Question 7

Answer any 4 out of the following 5 questions:

- (a) what are the steps involved in the simulation process? (4 Marks)
(b) What are the limitations of the learning curve theory ? (4 Marks)
(c) Briefly explain the phases in the life cycle of a product. (4 Marks)
(d) Explain briefly Pareto analysis and mention some of its uses. (4 Marks)
(e) Explain the concept of Just In time approach in a production process. (4 Marks)

Answer**(a) Steps in Simulation Process**

1. Define the problem or system you intend to simulate.
2. Formulate the model you intend to use.
3. Test the model; compare its behavior with the behavior of the actual problem environment.
4. Identify and collect the data needed to test the model.
5. Run the simulation.
6. Analyse the results of the simulation and, if desired, change the solution you are evaluating.
7. Rerun the simulation to test the new solution.
8. Validate the simulation, that is, increase the chances that any inferences you draw about the real situation from running the simulation will be valid.

(b) Limitations of Learning Curve Theory

1. All activities of a firm are not subject to learning effect. (Activities that have not been performed in the present operational mode, those performed by new or unfamiliar employees are subjected to learning effect, while those performed by familiar or experienced workmen will not be subjected to learning effect)
2. It is correct that learning effect does take place and average time taken is likely to reduce. But in practice it is highly unlikely that there will be a regular consistent rate of decrease. Therefore any cost prediction based on conventional learning curves should be viewed with caution.
3. Considerable difficulty arises in obtaining valid data that will form basis for computation of learning effect.
4. Even slight change in circumstances quickly renders the learning curve obsolete. While the regularity of conventional learning curves can be questioned, it would be wrong to ignore learning effect altogether in predicting costs for decision purposes.

(c) Phases in Life Cycle of a Product

Phase	Characteristics
Introduction	Product is launched. Profits are almost non-existent. Competition is almost negligible.
Growth	Sales/ Profits rise rapidly. Competition enters. At phase end, profits begin to decline.
Maturity	Sales increases but at a declining rate. Some firms extend their product lines with new models.

Saturation and decline	Drop in sales volume, need for product demand disappears. Better and cheaper substitutes are available in the market.
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(d) Pareto Analysis

Pareto Analysis is based on 80:20 rule that was a phenomenon first observed by Vilfredo Pareto, a nineteenth century Italian economist. He noticed that 80% of the wealth of Milan was owned by 20% of its citizens. This phenomenon or some kind of approximation of it says, (70:30) can be observed in many different business situations. The Management can use it in a number of different circumstances to direct management attention to the key control mechanism or planning aspects.

That is, about 70 to 80% of the value corresponds to 30 to 20 % of the volume.

Use of Pareto Analysis

1. Prioritize problems, goals and objectives
2. Identify root causes
3. Select and define key quality improvement programs
4. Select key employee relations improvement programs
5. Select key customers relations and service programs
6. Maximise research and product development times
7. Verify operating procedures and manufacturing processes
8. Product or services sales and distribution
9. Allocate physical, financial and human resources

(e) Just in Time in Production Process

1. Products, Spare parts/materials are received directly at production floor. Inspection is completed before delivery of materials.
2. Setup time is minimized while also reducing long production runs, thereby eliminating defectives, scrap and product obsolescence.
3. Work-in-progress is reduced by use of kanban card or working cells or both.
4. Workers are trained on a variety of machines, allowed to stop machines when they identify a problem, fix it or call the repair team and adequately compensated.
5. Supporting systems such as administration, accounting and cost reporting are suitably modified to shift from the conventional mode to the improved JIT requirements.