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.

Question 1

(a) *Tours &Travels Ltd. is publishing a number of Magazines on tours and travels. It will soon begin publication of a weekly magazine on tourism and lifestyle wellness for consumers. The weekly cost of publishing and distributing the magazine are estimated at ₹1,00,000(fixed) plus ₹30 per copy printed and sold.*

Revenue from advertising in the magazine is estimated at ₹55,000 per week irrespective of the number of copies sold.

Market research has indicated that demand for the magazine will depend on its selling price, as follows:

- *At a price of ₹120, no copies of the magazine would be sold.*
- *Each subsequent price reduction of ₹0.01 would increase demand for the magazine by one unit.*

Required:

(i) *Calculate optimal price for each magazine and the number of magazines that would be sold each week at the recommended price.*

(ii) *Calculate optimum profit per week.* ***(5 Marks)***

(b) *Fast Electronics Ltd., an online game manufacturing company, is planning to introduce a new online game 'FPO 20' with many additional graphic features. The company expects that this online game will have a life cycle of 3 years for which the following have been estimated:*

	Introductory Stage (Year 1)	***Growth & Maturity Stage (Year II)***	***Decline Stage (Year III)***
Units to be manufactured and sold	*17,500 Units*	*75,000 units*	*37,500 units*
Material Cost	*₹25,00,000*	*₹1,10,00,000*	*₹55,00,000*
Labour Cost	*₹5,00,000*	*₹36,00,000*	*₹18,33,000*
Marketing Cost	*₹8,15,000*	*₹10,00,000*	*₹1,63,000*
Related overheads	*₹5,00,000*	*₹ 9,75,000*	*₹ 7,64,000*

Following additional information is provided:

- *If the company decides to introduce the product, an amount equal to ₹ 12,50,000 needs to be incurred for product development.*
- *New machinery and tools costing ₹ 62,50,000 have to be purchased when the production commences and can be sold at the end of Year ₹ 2,50,000.*
- *The company applies life cycle costing for the online games and sets prices at 25% mark-up on the life cycle cost per unit.*

Required:

Calculate the selling price per unit of the online game 'FPO 20'. ***(5 Marks)***

(c) *The Z division of MCX Ltd. Produces a component which it sells externally and can also be transferred to division X. Division Z has set a performance target for the coming financial year of residual income of ₹ 50,00,000. The following budgeted information relating to Z division has been prepared for the coming financial year:*

- *Maximum production / sales capacity is 8,00,000 units.*
- *Sales to external customers 5,00,000 units at ₹ 37 per unit.*
- *Variable cost per component is ₹ 25.*
- *Fixed cost directly attributable to the division is ₹ 14,00,000.*
- *Capital employed in the division is ₹ 2,00,00,000 with cost of capital of 13%.*

The X division of MCX Ltd. has asked Z division to quote a transfer price for 3,00,000 units of the component.

Calculate the transfer price for the component which Z division should quote to X division so that its residual in come target is achieved.

(Residual Income is the excess of net divisional income over cost of capital on the investment made in the division) ***(5 Marks)***

(d) *DL Transport Company ships truckload of wheat from three storehouses to four flour mills the transportation cost per ton of wheat from the different storehouse to the flour mills, supply capacity of each storehouse and the demand of different flour mills are given in the following cost matrix table:*

		Flour Mills				***Supply (Ton)***
Storehouse		*1*	*2*	*3*	*4*	
	1	*1000*	*200*	*2000*	*1100*	*15*
	2	*1200*	*700*	*900*	*2000*	*25*
	3	*400*	*1400*	*1600*	*1800*	*10*
Demand (Ton)		*5*	*15*	*15*	*15*	

Required:

(i) Using Vogel's Approximation Method (VAM) and Least Cost Method, determine initial feasible solution.

(ii) Explain, why the same amount of transportation cost arrived in both VAM and Least Cost Method? ***(5 Marks)***

Answer

(a) We know that profit is maximum when MR is equal to MC

Marginal Revenue (MR) = a – 2bQ

a = price at which demand is zero

b = slope of demand curve

Q = Quantity Demanded

MR = ₹120 – 2(0.01 x Q)

MR = 120 – 0.02Q

Marginal Cost (MC) = Variable Cost per unit

MC = ₹30

MR = MC

i.e., 120 – 0.02Q = 30

0.02Q = 120 – 30 = 90

Q = 90/0.02

Q = 4,500 units

We know that, P = a – b Q

P = 120 – 0.01(4,500)

P = 120 – 45

P = ₹ 75

Calculation of Optimum Profit per week

	₹
Contribution at optimum level = 4500 x (75 - 30)	2,02,500
Add: Revenue from Advertising	55,000
	2,57,500
Less: Fixed Cost	1,00,000
Profit	1,57,500

(b) Computation of Total Cost of Product Life Cycle

	₹
Material Cost (25,00,000 + 1,10,00,000 + 55,00,000)	1,90,00,000
Labour Cost (5,00,000 + 36,00,000 + 18,33,000)	59,33,000
Marketing Cost (8,15,000 + 10,00,000 + 1,63,000)	19,78,000
Overheads (5,00,000 + 9,75,000 + 7,64,000) …	22,39,000
Product Development Cost	12,50,000
Machinery & Tools (62,50,000 – 2,50,000)	60,00,000
Total Life Cycle Cost	**3,64,00,000**

Expected Sales (17,500 + 75,000 + 37,500) = 1,30,000 units

Cost per unit = 3,64,00,000/1,30,000 = **₹ 280/-**

Expected Profit Margin = 25% on Cost

Selling Price = Cost + 25% = 280 + 70

Selling Price = ₹ 350 per unit

(c) Computation of contribution to be generated from internal transfer

		₹
Desired Residual Income		50,00,000
Less: Income expected from External Sales:		
Contribution 5,00,000 x (37 - 25) =	**60,00,000**	
Less: Fixed Costs =	14,00,000	
Less: Cost of Capital 2,00,00,000 @ 13%	26,00,000	20,00,000
Contribution to be generated from Internal Transfer		**30,00,000**

Internal Transfer = 3,00,000 units

Contribution to be generated per unit = 30,00,000/3,00,000 **= ₹ 10/-**

Transfer Price to be quoted = Variable Cost + Contribution required

= 25 + 10

= ₹ 35/- per unit

(d) (i) Initial Feasible Solution under VAM Flour Mills

STORE HOUSE	1	2	3	4	Supply	Penalty
1	1000	[15] 200	2000	1100	15/0	800/900/-
2	1200	700	[15] 900	[10] 2000	25/10/0	200/200/1100
3	[5] 400	1400	1600	[5] 1800	10/5	1000/200/200
Demand	5/0	15/0	15/0	15/5/0		
Penalty	600	500	700	700		
	-	500	700	700		
	-	-	700	200		

Initial Feasible Solution under Least Cost Method

Store House	1	2	3	4	Supply
1	1000	[15] 200	2000	1100	15/0
2	1200	700	[15] 900	(End) 2000 [10]	25
3	[5] 400	1400	1600	[5] 1800	10
Demand	5/0	15/0	15	15	

(ii) VAM uses the penalty or opportunity cost of not using the next best alternatives. The highest penalty is given the first preference. This need not be the lowest cost.

Whereas, Least Cost Method gives preference to the lowest cost cell, irrespective of the next higher cost.

Transportation Cost under VAM and LCM has been same in the given problem since the maximum penalty and the minimum cost are one and the same.

Question 2

(a) *J Limited is a consumer electronics company that specializes in manufacturing portable routers. It manufactures its own processor, which forms an integral part of the portable router. The following information pertains to the cost of manufacturing the processor:*

	Current Costs (2020) ₹	***Expected future cost (2021) ₹***
Variable manufacturing cost:		
Direct Material cost (per unit)	*450*	*425*
Direct manufacturing labour cost (per unit)	*125*	*110*
Variable manufacturing cost for setups, materials handling and quality control (per batch)	*4,000*	*3,720*
fixed manufacturing cost:		
Fixed manufacturing overhead costs that can be avoided if manufacturing ceases	*7,92,000*	*7,92,000*
Fixed manufacturing overhead costs of plant depreciation, insurance and administration, that cannot be avoided even if manufacturing ceases	*20,01,600*	*20,01,600*

J manufactured 6,000 units of processors in 2020 in 30 batches of 200 each. In 2021, the company anticipates requirement of 7,200 units of processor. The processors would be produced in 60 batches of 120 each.

Amber Limited another trader has approached J Ltd. for supplying processors in 2021 at ₹ 750 per unit, as per the requirement of J Ltd.

If J Ltd. Purchases processors from Amber Ltd., the currently available capacity can be used for manufacturing and sell memory card to a loyal customer resulting in the following incremental revenues and costs in 2021:

Total expected incremental future revenues	*₹ 53,75,000*
Total expected incremental future costs	*₹ 50,00,000*

Required:

(i) *Calculate the total expected manufacturing cost per unit of processor in 2021, if the product is produced in-house,*

(ii) *Evaluate whether J Ltd. should make the processors or buy them from Amber Limited, if the capacity currently used for processors is:*

  (a) *Left Idle.*

  (b) *Used to make memory card.*

(iii) *Explain, at which point of incremental revenue from processors, the decision to make or buy the processors would change form one the other.* ***(8 Marks)***

(b) *Given below are the objective function, constraints and the final simplex tableau for a linear programming product mix problem:*

Maximize Z = 5x + 4y

Subject to the constraints

6x + 4y ≤ 24 (Raw material A)

x + 2y ≤ 6 (Raw material B)

- x + y ≤ 1 (Market limit)

y ≤ 2 (Demand limit)

x, y ≥ 0

Final Simplex Tableau

C_B	Basic variable	Solution Values	$C_j \rightarrow 5$	4	0	0	0	0
			x	y	S_1	S_2	S_3	S_4
5	x	3	1	0	1/4	-1/2	0	0
4	y	3/2	0	1	-1/8	3/4	0	0
0	S_3	5/2	0	0	3/8	-5/4	1	0
0	S_4	1/2	0	0	1/8	-3/4	0	1
		Z_j	5	4	3/4	1/2	0	0
		C_j-Z_J	0	0	-3/4	-1/2	0	0

Z is expressed in rupees in lakh, while x and y are expressed in tons. The variables S_1, S_2, S_3 and S_4 are the slack variables associated with the respective constraints raw materials A, B market limit and demand limit.

Required:

(i) *Is the above solution optimal? Give brief reason.*

(ii) *Is the solution degenerate? Give brief reason.*

(iii) *Determine the optimal product mix and the profit contribution shown by the above solution.*

(iv) *Discuss the status of each resource (scare or abundant) as per the above solution.*

(v) *Does the LPP have any alternative optimal solution?*

(vi) *In case of an LPP having multiple optimal solutions, will the value of the objective function change?* ***(8 Marks)***

Answer

(a) (i) Computation of Total Expected Manufacturing Cost per unit

Items	7200 Units ₹	Per unit ₹
Direct Material Costs	30,60,000	425
Direct Labour Costs	7,92,000	110
Variable Cost (3720x60)/7200	2,23,200	31
Fixed manufacturing OH-Avoidable (7,92,000/7200)	7,92,000	110
Fixed manufacturing OH-Unavoidable (20,01,600/7200)	20,01,600	278
Total expected Cost (68,68,800/7200**)**	68,68,800	954

(ii) (a) Make/Buy comparison – When the capacity left Idle

	Total Cost (₹)		Per unit Cost (₹)	
	Make	Buy	Make	Buy
Purchase Price	-	54,00,000	-	750
Savings in Cost if production ceased: Direct Material	30,60,000		425	
Direct Labour	7,92,000		110	
Variable Cost	2,23,200		31	
Avoidable Fixed OH	7,92,000		110	
Total	48,67,200	54,00,000	676	750

Comment

By excluding the unavoidable fixed OH, which is common for both make and buy options, the cost saved from production is not more than the purchase price. Therefore, making processor is profitable.

(ii) (b) Make/Buy comparison – when the capacity used to make memory cards

Particulars	If Make		If Buy	
	Total Cost (₹)	Per unit cost (₹)	Total Cost (₹)	Per unit cost (₹)
Relevant Make Cost [(68,68,800-20,01,600)/7,200]	48,67,200	676		---
Relevant Buy Cost			54,00,000	750

If capacity used to manufacture memory card Incremental Contribution [(53,75,000-50,00,000)/7,200]			3,75,000	(52.08)
Net Cost	48,67,200	676	50,25,000	697.92

Comment:

Again the expected revenue from the production of memory card is not more than purchase price of processor. Therefore, making processor is profitable

(iii) Point of Incremental Revenue from **Memory Card***

	₹
Total expected incremental future cost (given)	50,00,000
Add: Difference in favour of making processor when the released capacity is idle (54,00,000-48,67,200)	5,32,800
	55,32,800

It would be indifferent between make/buy of processor, when the incremental revenue from **sale of memory card*** is **₹ 55,32,800**.

"The point of Incremental Revenue from Memory Card to change the decision from one to the other (make/buy) is the point at which the incremental contribution from memory card plus the cost of making the processors in house would be equal to the cost of buying the processors from external suppliers."

***Note-** Considered incremental revenue from "memory Card" instead of incremental revenue from "processors".

(b) **(i)** The solution is optimal. Since, all the elements in the $C_j - Z_j$ row are less than or equal to zero.

(ii) The above solution is not degenerate. Because none of the basic variables has zero value.

(iii) Optimal Product Mix: x = 3 Tons ; y = 3/2 Tons

Profit = (5 x 3) + (4 x 3/2) = **₹ 21 lakhs.**

(iv) The solution also gives the status of the resources. A resource is designated as scarce if its associated slack variable is zero – i.e., the activities have used the resources completely.

On the other hand, if the slack variable is positive, then the resource is abundant.

Resource	Slack Value	Status
Raw Material A	$S_1 = 0$	Scarce
Raw Material B	$S_2 = 0$	Scarce
Market Limit	$S_3 = 5/2$	Abundant
Demand Limit	$S_4 = 1/2$	Abundant

(v) The problem does not have any alternative optimal solution since, none of the non-basic variables S_1 and S_2 has the value Zero in $C_j - Z_j$ row.

(vi) In case of an LPP, having multiple optimal solution, a new solution can be obtained but the value of the objective function will not change.

Question 3

(a) QRS Limited produces two products 'ALX' and 'BMY' from different quantities of the same resources. The selling price and resource requirement of each of the products is as follows :

Product	***'ALX'*** ***(₹)***	***'BMY'*** ***(₹)***
Selling Price per unit	*330*	*423*
Resources per unit -		
Material X (₹ 12 per kg)	*60*	*48*
Direct Labour (₹ 25 per hour)	*75*	*125*
Machine Hours (₹ 40 per hour)	*120*	*160*

Market research shows that the maximum demand for products 'ALX' and 'BMY', during the month of October 2020 is 1200 units and 1920 units respectively. This does not include an order that the company has agreed with a commercial customer for the supply of 600 units of 'ALX' and 840 units of 'BMY' at selling prices of ₹ 280 and ₹ 387 per unit respectively. Although the customer will accept part of the order, failure by QRS Limited to deliver the order in full by the end of October 2020 will cause the company to incur a financial penalty of ₹ 20,000.

At a recent meeting of the purchasing and production managers to discuss the production plans of the company for the month of October 2020, the following resource restrictions were identified :

Material X	*20,400 kgs*
Direct labour hours	*18,000 hours*
Machine hours	*18, 000 hours*

Required:

(i) Assuming that QRS Limited completes the order with the commercial customer. From a financial perspective, prepare the optimum production plan for October, 2020 and calculate the contribution that would result from adopting this plan.

(ii) From a financial perspective, whether the company should complete the order for the commercial customer ? ***(8 Marks)***

(b) The following objectives belong to one of the four perspectives of the Balanced Score Card:

(i) Growth in free cash flow

(ii) Employee engagement score

(iii) Improve complaint resolution service

(iv) Increase market share

(v) Brand Identity

(vi) Asset utilization

(vii) Increase process capability

(viii) Responsive service

Required:

Classify each objective by perspective and suggest a possible measure that might be associated with the objective. ***(8 Marks)***

Answer 3

(a) (i) Determination of Optimum Production Plan

Optimum production plan is determined on the basis of contribution earned from one unit of scarce *resource. Therefore, the scarce resource should be ascertained first:*

Material X:

For ALX (1200 + 600 = 1800) x 5	= 9,000 kgs
For BMY (1920 + 840 = 2760) x 4	= 11,040 kgs
Total requirement	20,040 kgs
Available Quantity	20,400 kgs – Not a scarce resource.

Direct Labour Hours:

For ALX (1200 + 600 = 1800) x 3	= 5,400 hrs
For BMY (1920 + 840 = 2760) x 5	= 13,800 hrs
Total requirement	19,200 hrs

Available Direct Labour Hrs 18,000 hrs – a scarce resource.

Machine Hours:

For ALX (1800 x 3) = 5,400 hrs

For BMY (2760 x 4) = 11,040 hrs

Total requirement 16,440 hrs

Available Machine Hrs 18,000 hrs – Not a scarce resource.

Calculation of contribution per unit of scarce resource

	ALX (₹)		BMY(₹)	
Selling price		330		423
Less: Material X	60		48	
Direct Labour	75		125	
Machine Usage	120	255	160	333
Contribution per unit		75		90
Labour hours (Scarce resource) per unit		3(Hrs)		5(Hrs)
Contribution per hour (₹)		25		18
Rank		**I**		**II**

Optimum production plan (If Commercial Customer demand met first)

Direct Labour Hour is a scarce resource. Product ALX gives more contribution per hour of direct labour than Product BMY. Therefore, ALX should be produced to its fullest demand and the balance hours should be used for the production of BMY.

Total Direct Labour Hours available		18,000
Less: Usage for commercial customer:		
ALX (600 x 3)	= 1800	
BMY (840 x 5)	= 4200	6,000
		12,000
Less: Usage for market demand:		
ALX (1200 x 3)		3,600
Available for BMY		8,400

No. of units possible = 8400/5 = 1,680 units

Optimum Production: ALX = 600 + 1200 = 1800

BMY = 840 + 1680 = 2520

Computation of Contribution from Optimum Production Plan

Contribution from ALX:		₹
Commercial customer (280 - 255) x 600	= 15,000	
Market demand (330 - 255) x 1200	= 90,000	1,05,000
Contribution from BMY:		
Commercial customer (387 - 333) x 840	= 45,360	
Market demand (423 - 333) x 1680	= 1,51,200	1,96,560
Contribution		**3,01,560**

Note- This part can also be solved through Linear Programming.

(ii) Completion of order of Commercial Customer

From financial perspective point of view, whether commercial customers demand met first or external market demand met first should be based on from which the expected total contribution is more. Since there is a penalty clause in the order with commercial customer, the company can meet the order partially due to scarcity of resources by paying the penalty.

Total contribution from optimum production plan by meeting the **demand of commercial customers first** **= ₹3,01,560**

Total contribution from optimum production plan by meeting the **demand of external market first**:

Contribution from External Market ALX 1200x75 **= 90,000**

Contribution from External Market BMY 1920 x 90 **= 1,72,800**

Contribution from Commercial Customer:

ALX – per hour = (280 - 255) = 25/3 = ₹8.33 (II Rank)

BMY – per hour = (387 - 333) = 54/5 = ₹10.8 (I Rank)

Total Labour hour available		= 18,000
Less: Usage for external market demand: ALX 1200 x 3 = 3600		
	BMY 1920 x 5 = 9600	13,200
Hours available for Commercial Customer		4,800
Usage for BMY (I) 840 x 5		= 4,200
Usable for ALX (II)		600

600/3 = 200 units

Contribution from commercial customer:

ALX 200units @ ₹25	**5,000**
BMY 840units @ ₹54	**45,360**
Total Contribution	**3,13,160**
Less: Penalty	(20,000)
Net Contribution	**2,93,160**

Decision:

QRS Ltd., should meet the demand of commercial customers first in full and then external demand as given in optimum production plan. Since, the expected total contribution is more in this option.

Note: Optimum solution can also be arrived by alternative methods as below:

(ii) Whether the company should complete the order from the commercial customer

	ALX	BMY
External Market Demand	1,200 units	1,920 units
As per optimum production plan based on limiting factor	1,200 units	1,680 units
Shortfall in meeting external market demand		240 units
Loss of contribution from shortfall production of BMY 240 units x ₹90		**₹21,600**

Decision:

If Market demand is met first, then shortfall in meeting commercial customer demand is 400 units of ALX from which the loss will be (400 x₹25)+Penalty ₹20,000 = ₹30,000. In this case, the loss will be more by 30,000-21,600 = ₹8,400/-. Therefore, commercial customer demand should be met first.

(b)

Objective	Perspective	Measure
Growth in Free Cash Flow	Financial	% of growth in free cash flow
Employee Engagement Score	Learning and Growth	% of employees achieved target
Improve Complaint Resolution Service	Internal	% of customer give a positive feedback

Increase Market Share	Financial	% of increase in market share
Brand Identity	Customer	% of people recognise the brand (based on industry reports, etc.)
Asset Utilization	Internal Business	% of change in efficiency
Increase Process Capability	Learning and Growth	% of process using advanced technology
Responsive Service	Customer	% of complaints resolved on time % of on time delivery

Note- Alternative measures are also possible.

Question 4

(a) *Bfine is the leading provider of inpatient transition care facilities that enables individuals to be healthy and fine. The center runs two programs transition care and after care (which includes counselling, maintenance and support of patients after discharge from the center).*

Following is the budgeted cost of running the center for the year:

	₹	₹
Professional Salaries		
Doctors (8 doctors x ₹9,00,000)	*72,00,000*	
Physiotherapists (16 Physiotherapists x ₹2,40,000)	*38,40,000*	
Counsellors (8 counsellors x ₹1,80,000)	*14,40,000*	
Nurses (16 x ₹1,20,000)	*19,20,000*	*1,44,00,000*
Medical supplies (medicines and other pharmaceutical items)		*12,01,200*
Administrative costs (managing patient charts, food, laundry etc.)		*24,02,400*
Rent and clinic maintenance		*7,05,600*
Laboratory services		*4,66,200*
Total		*1,91, 75,400*

The CFO of the center wants to ascertain the cost of each program.

Following data describing employee allocations to individual programs has been compiled:

	Transition care	After care	Total Employees
Doctors	8		8
Physiotherapists	6	10	16
Counsellors	3	5	8
Nurses	6	10	16

Further, the CFO has decided to use activity-based costing for cost analysis. The following budgeted information has been gathered for the year.

	Transition care	After care	Total
Square feet of space occupied by each program	10,800	14,400	25,200
Number of patient - years	60	72	132
Number of laboratory tests	1,680	840	2,520

Required

(i) *Select appropriate cost allocation bases for allocating indirect costs to programs and calculate the budgeted indirect cost rates for medical supplies; administrative costs (managing patient charts, food, laundry, etc.); rent and clinic maintenance and laboratory services.*

(ii) *Using an activity based approach to cost analysis, calculate the budgeted cost of each program and the budgeted cost per-patient year of the transition care program.*

(8 Marks)

(b) *The following is budgeted and actual cost data of Star Limited for the period April 2020 to September 2020 :*

Particulars	Budget	Actual
Production	20,000 units	17 ,500 units
Material cost	₹ 40,00,000 (2,000 kgs @ ₹ 2,000)	₹ 37,44,000 (@ ₹ 2,080)
Labour cost	₹ 25,00,000 (@ (50 per hour)	₹ 24,99,750 (@ (55 per hour)
Variable overhead	₹ 3,75,000	₹ 3,50,000
Fixed overhead	₹ 5,75,000	₹ 7,87,500

In the second half of financial year October 2020 to March 2021, production is budgeted for 37,500 units, material cost will increase from last half year's actual by ₹220 per kg and however, it is proposed to maintain the material consumption efficiency of the second half period as given in the budget of first half period. Labour efficiency lowered in first half of actual production will be continued and further lowered 2% in budgeted production of second half (October 2020 to March 2021). Labour rate will be 55 per hour. Variable and fixed overheads will go up by 20% over actual incurred during the half year period April to September 2020.

Required:

Prepare the production cost budget for the period October 2020 to March 2021. ***(8 Marks)***

Answer

(a) (i) Computation of Indirect Cost Rates

Cost Pool	Cost (₹)	Cost Driver	Rate (₹)
Medical Supplies	12,01,200	Patient – years (132)	**9100**
Administrative costs	24,02,400	Patient – years (132)	**18,200**
Rent & Clinic maintenance	7,05,600	Space occupied (25,200)	**28**
Laboratory services	4,66,200	Lab tests (2520)	**185**

(ii) Computation of Budgeted cost of programs

Particulars	Transition Care (₹)	After Care (₹)	Total (₹)
Doctors(8:0) @ ₹9,00,000	72,00,000	---	72,00,000
Physiotherapists (6:10) @ ₹ 2,40,000	14,40,000	24,00,000	38,40,000
Counselors (3:5) @ ₹ 1,80,000	5,40,000	9,00,000	14,40,000
Nurses (6:10) @ ₹ 1,20,000	7,20,000	12,00,000	19,20,000
Medical Supplies (60:72) @ ₹9,100	5,46,000	6,55,200	12,01,200
Administrative costs (60:72) @ ₹18,200	10,92,000	13,10,400	24,02,400
Rent and clinic maintenance (10,800:14,400) @ ₹28	3,02,400	4,03,200	7,05,600
Laboratory services (1,680:840) @ ₹185	3,10,800	1,55,400	4,66,200
Total	1,21,51,200	70,24,200	1,91,75,400

Computation of Budgeted cost per-patient year of transition care program

Budgeted cost per patient per year = Total Cost / No. of patient years

= 1,21,51,200 / 60

= **₹2,02,520/-**

(b) Computation of revised budgeted rate per unit of various cost elements for the period October 2020 – March 2021

WN 1: Budgeted Material Quantity:

It is given that material consumption efficiency of the second half period is proposed to be maintained as given in the budget of first half period.

Budgeted material consumption per unit = 2,000 kg / 20,000 units = 0.1 kg.

Budgeted quantity of material for the budgeted production = 37,500 x 0.1 = 3750 kgs.

WN 2: Budgeted Material Cost per kg:

It is given that material cost will increase from last half year's actual by ₹220 per kg.

Actual material cost in the last half year = ₹2,080 per kg

Add: Expected increase = ₹ 220 ''

Revised Material Cost **₹ 2,300 per kg**

WN 3: Budgeted Labour Hour:

It is given that labour efficiency lowered in first half of actual production will continue and further lowered by 2% in budgeted production of second half.

Total Budgeted Hours= 25,00,000 / 50 = 50,000 hours

Labour Hour Budget for each unit= 50,000 / 20,000 =2.5

Actual time paid = 24,99,750 / 55 = **45,450 hours**

Actual Labour Hour for second half = [(45,450 + 2% of 45,450) / 17,500] x 37,500

= **99,341 hrs.**

Alternatively

Total Budgeted Hours= 25,00,000 / 50 = 50,000 hours

Budgeted time per unit = 50,000/20,000 = 2.5 hrs

Budgeted time for actual production = 17,500 x 2.5 = 43,750 hrs

Actual time for actual production = 24,99,750/55 = 45,450 hrs

Labour efficiency in first half = (43750/45,450) x 100 = 96.26%

Expected labour efficiency in the second half = 96.26 – 2 = **94.26%**

Budgeted labour hour as per original budget = 37,500 x 2.5 = 93,750 hrs.

Revised budgeted labour hour = (93,750/94.26) x 100 = **99,459 hrs.**

Note- Efficiency can also be calculated in any other alternative way.

WN 4: Budgeted Variable Overhead Rate:

It is given that VOH will go up by 20% over actual incurred during the half year period. It should be calculated per unit basis.

Total Actual VOH = ₹ 3,50,000

Actual VOH per unit = ₹ 3,50,000 / 17,500 = ₹20/-

Add: Increase 20% = ₹ 4/-

Budgeted VOH Per Unit **₹ 24/-**

WN 5: Budgeted Fixed Overhead:

It is given that fixed OH will go up by 20% over actual incurred during the half year period.

FOH does not vary directly with volume of output. It varies in total, accordingly:

FOH = Actual + 20%

= 7,87,500 + 20% = 7,87,500 + 1,57,500 **= ₹9,45,000/-**

Production cost budget for the period October 2020 to March 2021 for 37,500 units

	₹		₹
Material (3750 kg @ ₹2300)	86,25,000		86,25,000
Labour (99,459 hrs @ ₹55)	54,70,245	(99,341@ 55)	54,63,755
Variable OH (37,500units @ ₹24)	9,00,000	**[Or]**	9,00,000
Fixed OH	9,45,000		9,45,000
Total Budgeted Cost	**1,59,40,245**		**1,59,33,755**

Question 5

(a) *Sportswear Ltd. produces and sells two types of Track suits – synthetic and cotton. The market for synthetic track suits is large and competitive, but traditionally the cotton track suits market has been small with only a few competing manufacturers.*

The operating budget and actual results for the year 2019-2020 were as follows:

Particulars	***BUDGET***		***ACTUAL***	
	Synthetic Track	***Cotton Track***	***Synthetic Track***	***Cotton Track***
Sales (units)	*18,000*	*2,000*	*16,500*	*6,000*
Sales Revenue (₹)	*54,00,000*	*12,00,000*	*54,45,000*	*35,40,000*
Total variable cost (₹)	*36,00,000*	*8,40,000*	*33,00,000*	*25,20,000*

Contribution margin (₹)	*18,00,000*	*3,60,000*	*21,45,000*	*10,20,000*
Market size (units) in 2019-20	*90,000*	*5,000*	*75,000*	*10,000*

No inventories of direct materials or finished goods are held. A standard marginal costing system is used.

Required:

(i) Analyses the sales and marketing variances into sales price, sales quantity, sales mix, market size and market share variance. Clearly indicate each variance as favorable or unfavorable / adverse.

(ii) Reconcile the budgeted contribution and actual contribution.

(iii) Comment on the performance of the marketing department. ***(10 Marks)***

(b) The performance reporting system of PXZ Ltd. does not highlight quality costs. The following information is available in respect of the year ended 31st March 2020:

Production data

Units reworked	*2,000*
Units repaired under warranty service	*2,400*
Design engineering hours	*80,000*
Inspection hours (manufacturing)	*2,40,000*

Cost data:	***₹***
Design engineering cost per hour	*120*
Inspection cost per hour (manufacturing)	*60*
Rework cost per heating and welding system unit reworked (manufacturing)	*4,000*
Customer support cost per repaired unit (marketing)	*250*
Transportation costs per repaired unit (distribution)	*300*
Warranty repair costs per repaired unit	*4,500*

Staff training costs amounted to ₹1,80,000 and additional testing costs were ₹ 1,50,000. The marketing manager has estimated that sales of 1,000 units were lost due to bad publicity in trade journals and social media. The average contribution per unit of sales lost is estimated to be ₹12,000.

Required:

Prepare a 'Cost of Quality' report for PXZ Ltd. using appropriate headings for the year ended 31st March 2020. ***(6 Marks)***

Answer

(a) Computation of Weighted Average Standard Contribution per unit

	Synthetic	Cotton
Budgeted Selling Price per unit (₹)	54,00,000/ 18,000	12,00,000/ 2,000
	= 300	600
Less: Budgeted variable cost per unit (₹)		
(36,00,000/18,000) ; (8,40,000/2000)	= 200	420
Standard contribution per unit	100	180

Weighted Average Standard Contribution per unit (₹)

WASC = (0.9x100) + (0.1x180) = ₹108/-

Actual Selling Price per unit (₹)		
(54,45,000/16,500) ; (35,40,000/6000)	330	590

Sales Price Variance:

(i) Computation of variances

Sales price variance = (AP – BP) x AQ

Synthetic = (330- 300) x 16,500 =4,95,000 (F)

Cotton = (590 - 600) x 6000 = 60,000(A)

4,35,000 (F)

Sales Quantity Variance:

Sales quantity variance = (AQ - BQ) x WASC

= (22,500 – 20,000) x 108

= **2,70,000 (F)**

Alternatively

Sale quantity variance = (AQ in Std. Mix – BQ in Bud. mix) x Std. Contribution per unit

Synthetic = [(22,500 x 90%) – 18,000] x 100 = 2,25,000 (F)

Cotton = [(22,500 x 10%) – 2,000] x 180 = 45,000 (F)

2,70,000 (F)

Sales Mix Variance:

Sales mix variance = (AQ in Actual mix – AQ in Std. mix) x Std. Contribution

Synthetic = (16,500 – 20,250) x 100 = 3,75,000 (A)

Cotton = (6,000 – 2,250) x 180 = 6,75,000 (F)

3,00,000 (F)

Market size variance:

Market Size Variance = Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (Average Budgeted Cont. *per unit*)

= [(20,000/95,000)×(85,000–95,000)]× ₹108

= 2,27,368 (A)

Alternatively

Market size variance = Bud. Market share% x (Act. Market size – Bud. Market size) x WASC

Synthetic = 20% x (75,000 – 90,000) x 108 = 3,24,000 (A)

Cotton = 40% x (10,000 – 5,000) x 108 = 2,16,000 (F)

1,08,000 (A)

Market Share Variance:

Market Share Variance = (Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (Average Budgeted Cont. *per unit*)

= [(22,500/85,000) – (20,000/95,000)] × 85000 × ₹108

= 4,97,368 (F)

Alternatively

Market share variance = (Act. market share% - Bud. Market share%) x Act. Market size x WASC

Synthetic = (22% - 20%) x 75,000 x 108 = 1,62,000 (F)

Cotton = (60% - 40%) x 10,000 x 108 = 2,16,000 (F)

3,78,000 (F)

(ii) Reconciliation of Budgeted Contribution and Actual Contribution

			₹
Budgeted Contribution Margin (18,00,000 + 3,60,000)			21,60,000
Sales price variance		**4,35,000 (F)**	
Market size variance	2,27,368 (A) / 1,08,000 (A)		
Market share variance	4,97,368(F)/ 3,78,000 (F)		
Sales quantity variance		**2,70,000 (F)**	
Sales mix variance		**3,00,000(F)**	
			5,70,000 (F)
Actual Contribution Margin (21,45,000 + 10,20,000)			**31,65,000**

(iii) Comment on performance of marketing department:

The marketing department is held responsible for the sales price, sales mix and market share variances. All these variances are favorable variances. The marketing department managed to increase contribution margin by making changes to sales price and shifting the mix to cotton track suit. With respect to market share also, in both cases, actual share achieved were more than the budgeted share. As a whole the performance of the marketing department was satisfactory.

(b) Cost of Quality Report of PXZ Ltd. For the year ended March 31, 2020)

	Total Cost (₹)
Prevention Cost:	
Design Engineering [80,000 hrs @ ₹120]	96,00,000
Training of Staff	1,80,000
	97,80,000
Appraisal Cost:	
Inspection Cost (Manufacturing) [2,40,000 hrs. @ ₹60]	1,44,00,000
Product Testing	1,50,000
	1,45,50,000
Internal Failure Cost:	
Rework (Manufacturing) [2,000 units @ ₹4,000]	80,00,000
External Failure Cost:	
Customer Support (Marketing) [2,400 units @ ₹250]	6,00,000
Transportation Cost (Distribution) [2400 units @ ₹300]	7,20,000
Warranty Repair [2400 units @ ₹4500]	1,08,00,000
Contribution lost due to lost sales [1000 units @ ₹12,000]	1,20,00,000
	2,41,20,000
Total Quality Costs	5,64,50,000

Question 6

(a) Covers & Wrappers Ltd. manufactures sofa covers in a range of designs using high quality fabrics. Sales are made exclusively online, and the company's website allows for customisation of covers based on buyer preferences. The company operates an activity-based costing (ABC) system.

When an order is received for sofa cover, the requisitions department reserves the material and labour required to produce it. The design costs and production scheduling costs both relate to the customer preferences. The more detailed design in the sofa cover, the more machines involved and the more machine set ups required.

The sofa covers are subject to inspection during the production process to ensure that they are as per the customisation and meet quality standards. A margin of 45% on the selling price is kept on each cover sold.

Cost and activity information for the first half of the financial year 2020-2021 are given below :

Requisition costs	*₹ 2,70,000*
Design costs	*₹ 7,66,500*
Production scheduling costs	*₹ 6,57,000*
Quality control costs	*₹ 2,64,000*
Finishing costs	*₹ 1,50,000*
Finishing department labour hours	*12,500 labour hours*
Number of machine setups	*36,500 setups*
Number of inspections	*52,800 inspections*
Number of order received online	*18,000 orders*

Details relating to two orders are as follows :

	Order No. 3S4512	***Order No. 281809***
Direct materials	*₹ 1,000*	*₹ 795*
Direct labour	*₹ 563*	*₹ 426*
Number of machine setups	*5*	*3*
Number of inspections	*4*	*2*
Finishing labour hours	*15 minutes*	*20 minutes*
Number of orders	*1*	*1*

A discount of 20% and 25% was offered on Order No. 3S4512 and 2S1809 respectively on their respective normal selling price on the occasion of "Independence Day Grand Sale Offer".

Required:

(i) Using the company's policy and the discount offered to the customers, compute the selling price that would be charged for the above two orders.

(ii) Calculate the percentage of profit earned on selling price in these two orders.

(10 Marks)

(b) The following table lists the jobs of a network with their estimates

Activity	*Duration (Days)*		
	Optimistic	*Most likely*	*Pessimistic*
1-2	*3*	*6*	*15*
1-6	*2*	*5*	*14*
2-3	*6*	*12*	*30*
2-4	*2*	*5*	*8*
3-5	*5*	*11*	*17*
4-5	*3*	*6*	*15*
6-7	*3*	*9*	*27*
5-8	*1*	*4*	*7*
7-8	*4*	*19*	*28*

Required:

(i) Draw the network diagram.

(ii) Calculate the expected time and variance of each activity.

(iii) Find out the expected length and standard deviation of the critical path. ***(6 Marks)***

Answer

(a) Calculation of Cost Driver Rates

Activity	Cost Driver	Cost (₹)	Rate (₹)
Requisition Costs	Order received (18,000)	2,70,000	15
Design Costs	Machine Setup (36,500)	7,66,500	21
Production Scheduling Costs	Machine Setup (36,500)	6,57,000	18
Quality Control Costs	Inspections (52,800)	2,64,000	5
Finishing Costs	Department Labour Hours (12,500)	1,50,000	12

Calculation of Total Overheads for each Order

	Order No. 3S4512 (₹)		Order No. 2S1809 (₹)	
Requisition Cost		15		15
Design Cost	(21x5)	105	(21x3)	63
Production Scheduling Costs	(18x5)	90	(18x3)	54

Quality Control Cost	(5x4)	20	(5x2)	10
Finishing Cost	(12/60) 15	3	(12/60) 20	4
Total Overheads		**233**		**146**

(i) Calculation of Selling Price of the Orders

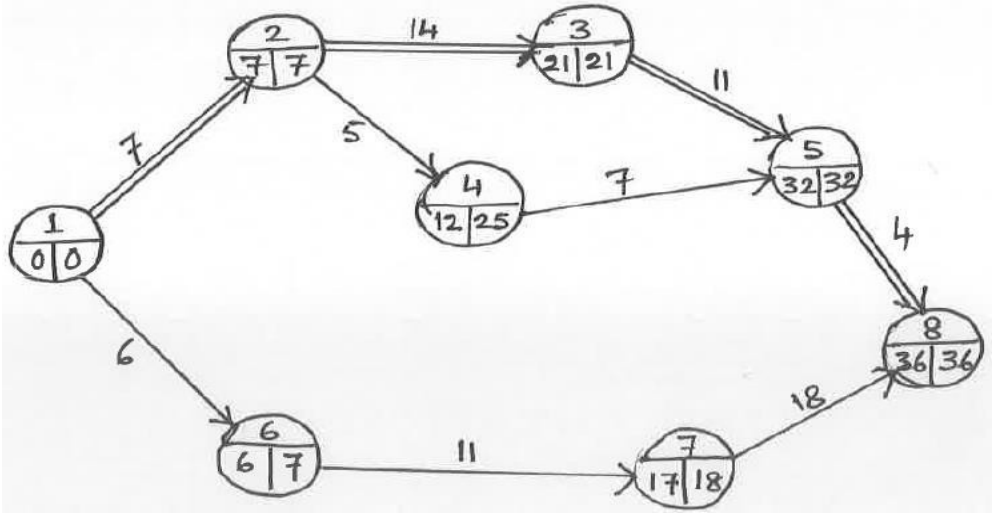
	Order No. 3S4512 (₹)	Order No. 2S1809 (₹)
Direct Materials	1,000	795
Direct Labour	563	426
Overheads	233	146
Total Production Cost	**1796**	**1367**
Add: Profit Margin @ 45% on selling Price	1469	1118
Normal Selling price	**3265**	**2485**
Less: Discount (20%); (25%)	653	621
Selling Price to be charged	**2612**	**1864**

(ii) Calculation of percentage of Profit on selling price:

Percentage of Profit = [(2612-1796) / 2612]x 100 [(1864-1367)/1864]x100

= 31.24% 26.66%

(b) (i) Network Diagram:



(ii) Calculation of expected time and variance of activities:

Activity	Expected Time	Variance
	$t_e = \frac{t_o + 4t_m + t_p}{6}$	$S_t^2 = \left(\frac{t_p - t_o}{6}\right)^2$
1–2	7	4
1–6	6	4
2–3	14	16
2–4	5	1
3–5	11	4
4–5	7	4
6–7	11	16
5–8	4	1
7–8	18	16

(iii) Calculation of Expected Length and Standard Deviation of Critical Path:

Critical path = 1 – 2 – 3 – 5 – 8

Expected length of critical path = 7+14+11+4 = **36 Days**

Standard Deviation of Critical Path = $\sqrt{\sigma^2}$ = $\sqrt{4 + 16 + 4 + 1}$

= $\sqrt{25}$ = **5**

Question 7

Answer any four out of the following five questions:

(a) Explain, how the implementation of JIT approach to manufacturing can be a major source of competitive advantage. ***(4 Marks)***

(b) State the importance of random numbers in Monte Carlo Simulation method. ***(4 Marks)***

(c) How will you solve an assignment problem where (Consider each situation independently)

(i) A particular assignment is prohibited.

(ii) Maximize an objective function. ***(4 Marks)***

(d) Autocare Ltd. is about to launch a new product into the market with a marginal cost of ₹100 per unit. A market research was carried out at a cost of ₹50,000 to test the feasibility of the launch. The results were as follows:

Selling price per unit	*Demand for the new product*
₹ 150	*30,000 units*
₹ 250	*25,000 units*
₹ 300	*20,000 units*

The current capacity is 20,000 units but additional capacity can be made available using resources of another product line. If this is done, the lost contribution from the other product line will be ₹ 1,50,000 for each additional 5,000 units of new product produced. What would be the best launch price? ***(4 Marks)***

(e) The research and development wing of Electronics Ltd. has developed a new kind of energy efficient inverter motor with 5-star rating from Bureau of Standards of Energy for use in industrial generator. The initial trials noted that it would take 10 hours for the first motor, which is subject to learning curve of 80%. The cost of material per motor would be ₹ 2,500, labour charges ₹ 175 per hour and overheads amount to 125% of labour cost.

The first order received is for delivery of eight motors.

What price should the company quote to have a profit margin of 20% on sales? ***(4 Marks)***

Answer

(a) Competitive Advantages of JIT:

- Stocks of raw materials and finished goods are eliminated and stock holding costs are avoided.
- It aims at elimination of non-value added activities and elimination of cost in this direction will give a competitive advantage.
- It affords flexibility to customer requirements where the company can manufacture customized products.
- It focuses the direction of performance based production of high quality products.
- It minimizes waiting time and transportation costs.

(b) Importance of random numbers:

- Random number is a number in a sequence of numbers whose probability of occurrence is the same as that of any other number in that sequence.
- In Monte Carlo Simulation method, it helps to solve the problems:

  - Depend upon probability

  - Where physical experimentations is not possible

  - Where creation of mathematical formula is not possible

(c) Solving Assignment Problem:

(i) Assignment is prohibited:

Sometimes technical, legal, climatical or other restrictions do not permit assignment of a particular facility to a particular job. Such difficulty can be overcome by assigning a very high cost (say M or infinite cost ∞) to the corresponding cell. By this, while doing the row minimization and column minimization operations, the activity will be automatically excluded from the optimal solution.

(ii) Maximize function:

Some of the assignment problems deal with the maximization of an objective function rather than to minimize it. For example, it may be required to assign persons to jobs in such a way that the expected profit is maximum. Such problem may be solved easily by converting it to a minimization problem. This conversion can be easily done by subtracting from the highest element, all the elements of the given matrix.

(d) Determination of best launch price:

Selling Price p.u (₹)	Demand (units)	Variable Cost (₹)	Oportun. Cost (₹)	Total Cost (₹)	Sales Revenue (₹)	Contribution (₹)
150	30,000	30,00,000	3,00,000	33,00,000	45,00,000	**12,00,000**
250	25,000	25,00,000	1,50,000	26,50,000	62,50,000	**36,00,000**
300	20,000	20,00,000	--	20,00,000	60,00,000	**40,00,000**

The contribution from the new product to be launched would be highest when sales demand is 20,000 units. Therefore, the optimum launch price would be ₹300/-.

(e) Calculation of labour hours required

No. of units	Cumulative Average Time per unit (hrs.)	Total Hours
1	10	10
2	8	16
4	6.4	25.6
8	5.12	40.96

Calculation of price to be quoted for 8 motors

	₹
Material Cost (8 x ₹2,500)	20,000
Labour Cost (40.96 x ₹175)	7,168
Overheads (7168 x 125%)	8,960
Total Cost	**36,128**
Add: Profit 20% on sales i.e., 25% on cost	9,032
Price to be quoted	**45,160**