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PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

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

Situations given in theory questions need not be copied into the answer books.

Working Notes should form part of the answer.

Question No.1 is compulsory.

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

Question 1

(a) *PQR Ltd., a manufacturer of tool kits has just completed XY's domestic order of 100 kits at a price of ₹1,650 per kit. The details of cost for XY's order are:*

	Cost (₹)
Direct Material	*90,000*
Direct Labour	*32,000*
Tools and Consumables	*16,400*
Variable overheads	*9,600*
Fixed overheads (allocated)	*15,000*
Total	*1,63,000*

The company wishes to evaluate a special export order from Expo Ltd. of similar 300 kits at ₹1,600 per kit. For the export order, special packing has to be done at ₹20 per kit. An additional fixed inspection cost specific to this export order has to be incurred. The allocation of fixed overheads will be revised to increase by ₹ 25,000. Tools, and Consumables above include special purpose tools costing ₹ 10,000 incurred for XY's order and these can be reused for the export order and the remaining portion is variable. PQR Ltd. wishes to accept the export order at 10% profit on the selling price.

What should be the maximum amount that can be incurred as inspection cost for making such an acceptance possible?

If Expo Ltd. offers to take the products without inspection, what is the maximum discount (as a percentage of the existing export price) that PQR Ltd. can offer to retain its 10% profit on the revised selling price? (Round off calculations to two decimal places). *(5 Marks)*

(b) *A company processes different products from a certain raw material. The raw material is processed in process I (where normal loss is 10% of input) to give products A and B in the ratio 3 : 2. B is sold directly. A is processed further in process II (where normal loss is 12.5% of output) to give products C and D in the ratio 5:3. At this point C and D have sale values ₹55 and ₹40 per kg respectively. C can be processed further in process III with processing cost ₹ 3,95,600 and normal wastage 5% of input and then be sold at*

₹ 66 per kg. D can be processed further in process IV with processing cost ₹ 3,82,500 and normal wastage 12.5% of output and then be sold at ₹ 55 per kg. The normal wastage of each process has no realizable value. During the production period, 2,00,000 kgs of raw material is to be introduced into Process I.

Using incremental cost-revenue approach, advise whether sale at split off or further processing is better for each of the products C and D. *(5 Marks)*

(c) A Ltd. is going to introduce Total Quality Management (TQM) in its company. State whether and why the following are valid or not for the successful implementation of TQM.

(i) Some departments serve both the external and internal customers. These departments have been advised to focus on satisfying the needs of the external customers.

(ii) Hold a training program at the beginning of a production cycle to ensure the implementation of TQM.

(iii) Implement Management by Objectives for faster achievement of TQM.

(iv) Appoint the Head of each department as the person responsible to develop improvement strategies and performance measures.

(v) Eliminate wastage of time by avoiding documentation and procedures. *(5 Marks)*

(d) A salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. Cost (in ₹ '000) of travelling from one city to another is given below You are required to find out the least cost route.

From / To	P	Q	R	S	T
P	-	6	12	4	6
Q	6	-	10	4	6
R	12	10	-	12	8
S	4	4	12	-	12
T	6	6	8	12	-

(5 Marks)

Answer

(a) Statement Showing Permissible Cost *per kit*

Items of Cost	(₹)
Direct Material $\left(\frac{₹\,90,000}{100\ kits}\right)$	900

Direct Labour $\left(\frac{₹32,000}{100 kits}\right)$	320
Consumables $\left(\frac{₹16,400 - ₹10,000}{100 kits}\right)$	64
Variable Overheads $\left(\frac{₹9,600}{100 kits}\right)$	96
Existing Variable Cost *per kit*	1,380
Add: Special Packing Cost *per kit*	20
Total Variable Cost *per kit*	1,400
Export Offer Price *per kit*	1,600
Expected Profit (10% on Selling Price)	160
Total Permissible Cost *per kit*	1,440

Maximum Inspection Cost *per kit* for making export offer acceptable is ₹40

...(₹1,440 − ₹1,400)

As Total Cost excluding Inspection Cost is ₹1,400 so the Selling Price will be ₹1,555.56

$\ldots\left(₹1,400 \times \frac{100}{90}\right)$

Maximum Possible Discount on the Revised Selling Price is ₹ 44.44

... (₹1,600 − ₹1,555.56)

Percentage of Discount is 2.77%

$\ldots\left(\frac{₹44.44}{₹1,600} \times 100\right)$

Hence Maximum Discount of 2.78 *percent* can be offered to retain 10% Profit on the Revised Selling Price.

Allocated Fixed Overheads amounting to ₹ 25,000 and Reusable Special Tools amounting to ₹10,000 are *irrelevant* and hence ignored in the *decision making process*.

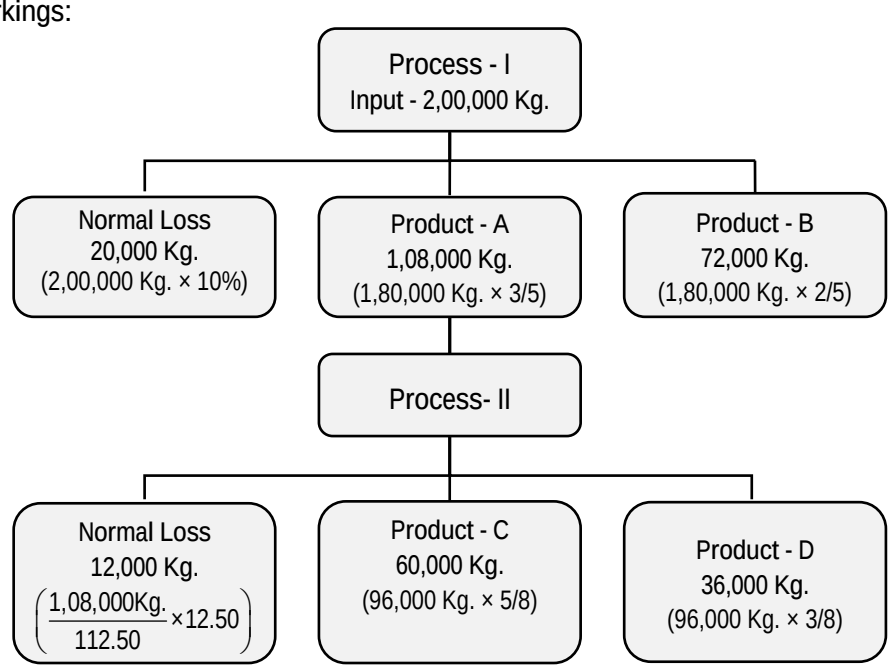
☞ This question can be solve by 'Total Cost & Revenue' approach.

(b) Statement Showing Decision on Sale at - Split-off Point or After Further Processing

Product	Product - C	Product - D
Quantity at Split off Point (Kg.)	60,000	36,000

Selling Price at Split off Point (₹)	55	40
Sales Revenue (₹) ... [A]	33,00,000 (60,000 Kg. × ₹55)	14,40,000 (36,000 Kg × ₹40)
Quantity if Processed Further (Kg.)	57,000 (60,000 Kg. × 95%)	32,000 $\left(\frac{36,000Kg.}{112.5}\times 100\right)$
Selling Price (₹) *per unit*	66	55
Sales Revenue (₹) ...[B]	37,62,000 (57,000 Kg. × ₹66)	17,60,000 (32,000 Kg. × ₹55)
Incremental Revenue ...[C] = [B] − [A]	4,62,000	3,20,000
Incremental Cost (₹) ...[D]	3,95,600	3,82,500
Profit / (Loss) ...[C] − [D]	66,400	(62,500)
Decision	Process Further	Sale at Split-off Point

Workings:



☞ It is not necessary *to show* above presentation.

(c)

Point	Valid/ Invalid	Reason
(i)	Invalid	TQM advocates focus to be given on both external and internal customers. Hence, focus satisfying the needs of the external customers only will not be valid for the successful implementation of TQM.
(ii)	Valid	Training at the beginning would improve productivity by bringing standardization in work habits and eliminating variations in production.
(iii)	Invalid	For implementation of TQM, Management by Objectives should be eliminated as targets of production will encourage delivery of poor quality goods and thus will defeat the collective nature of TQM.
(iv)	Invalid	Appointing the head of each department as the responsible person is not valid for the successful implementation of TQM as Total Employee Involvement (TIE) principle is an important part of TQM.
(v)	Invalid	Documentation, procedures and awareness of current best practice are essential in TQM implementation. If documentation and procedures are in place then only improvement can be monitored & measured and consequently deficiency can be corrected.

☞ Conceptually correct brief reason along with the validity of recommendation (Valid or Invalid) is sufficient.

(d) Row Operation

Cities	P	Q	R	S	T
P	-	2	8	0	2
Q	2	-	6	0	2
R	4	2	-	4	0
S	0	0	8	-	8
T	0	0	2	6	-

Column Operation

Cities	P	Q	R	S	T
P	-	2	6	0	2
Q	2	-	4	0	2
R	4	2	-	4	0
S	0	0	6	-	8
T	0	0	0	6	-

Since the minimum number of lines covering all zeros is equal to 4 which is less than the number of columns / rows (=5), the above table will not provide optimal solution. Subtract the minimum uncovered element (=2) from all uncovered elements and add to the elements lying on the intersection of two lines, we get the following matrix-

Cities	P	Q	R	S	T
P	-	0	4	0	2
Q	0	-	2	0	2
R	2	0	-	4	0
S	0	0	6	-	10
T	0	0	0	8	-

Or

Cities	P	Q	R	S	T
P	-	0	4	0	2
Q	0	-	2	0	2
R	2	0	-	4	0
S	0	0	6	-	10
T	0	0	0	8	-

The routes and their associated costs are as follows:

From	To	Cost (₹)
P	Q	6,000
Q	S	4,000
R	T	8,000

S	P	4,000
T	R	8,000
	Total	30,000

P → Q → S → P route does not cover the destination R and T so, these routes are not optimal and alternative route should be find out.

Let us find out alternative routes from the obtained reduced matrix.

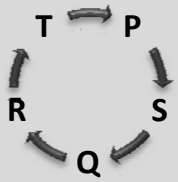
Cities	P	Q	R	S	T
P	-	0	4	0	2
Q	0	-	2	0	2
R	2	0	-	4	0
S	0	0	6	-	10
T	0	0	0	8	-

From	Possible Routes	Route Selected	Reasoning
P	P → Q, P → S	P → S	P → Q has already been rejected.
Q	Q → P, Q → S, Q → R, Q → T	Q → R	Q → P does not cover the other cities. Q → S has already been rejected. So we need to move towards next lowest cost destination i.e. '2'. There are two possibilities i.e. Q → R or Q → T. Q→ T is not possible as destination T has already been selected.
R	R → Q, R → T	R → T	R → T has already been selected.
S	S → P, S → Q.	S → Q	S → P has already been rejected.
T	T → P, T → Q T → R	T → P	Destination Q and R have already been selected.

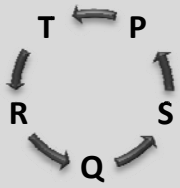
The possible least cost route is P → S → Q → R → T → P

From	To	Cost (₹)
P	S	4,000
S	Q	4,000
Q	R	10,000
R	T	8,000
T	P	6,000
	Total	32,000

Path Shown in Solution:



Alternative Path:



Possible Least Cost is ₹ 32,000 in both of the cases.

Question 2

(a) *AXE Ltd. manufactures four products A, B ,C and D. The following details are available for a production period:*

	A	*B*	*C*	*D*
Selling price	*100*	*109*	*121*	*124*
Material cost	*40*	*42*	*46*	*40*
Labour cost				
Assembly Dept. @ ₹10 per hour	*15*	*20*	*15*	*20*
Machine Dept. @ ₹12 per hour	*18*	*24*	*36*	*30*
Variable overheads @ ₹4 per labour hour in assembly dept.	*6*	*8*	*6*	*8*
Maximum external demand (units)	*40,000*	*55,000*	*36,000*	*30,000*

Total fixed cost is dependent on the output level and is tabulated below at different levels of output:

Production units (any combination of one or more of any A, B, C or D)	*Total fixed cost (₹)*
Zero to 1,00,000 units	*8,43,000*
1,00,001 to 1,50,000 units	*12,50,000*
1,50,001 to 2,00,000 units	*16,00,000*

Production facilities can be interchangeably used among the products.

Labour availability in the assembly department is limited to 2,20,000 hours for the production period. A local firm has offered to make any quantity of any of the products on a sub-contract basis at the following rates:

	A	B	C	D
Sub-contract Price (₹/unit)	85	95	101	100

(i) *Advise the management on how many units of each product are to be manufactured or subcontracted to fulfill maximum market demand. What would be the corresponding profits?*

(ii) *What is the minimum number of units to be produced to achieve break-even point?*

(iii) *What would you advise as the best strategy to maximize profits if assembly labour is not a limiting factor and if there is no compulsion to fulfill market demand?*

(Only relevant figures need to be discussed. A detailed profitability statement is not required). *(10 Marks)*

(b) *A computer service centre services laptops. It is proposed to study the arrival and servicing pattern of the service centre. The following in information was collected, over a period of 100 days.*

No. of computers	Frequency of arrival	Frequency of service
8	10	15
9	25	20
10	20	25
11	15	16
12	18	14
13	12	10

Simulate the arrival and servicing pattern for 10 days and find out the average number of laptops held for more than one day for service. Assume FIFO method is followed for service/repair and there is one laptop held from previous day for repair at the beginning of the first day.

Use the following series of random numbers:

Arrivals	69	45	46	10	82	16	35	70	57	92
Service	52	36	62	49	68	77	55	66	51	88

(6 Marks)

Answer

(a) (i) Assembly Labour is a Limiting Factor & *to fulfill* Maximum Market Demand:

Statement Showing Contribution *per unit* as well as Contribution *per assembly hour*

	Demand (Units)			
	40,000	55,000	36,000	30,000
	A	B	C	D
Selling Price (₹/u)	100	109	121	124
Material Cost (₹/u)	40	42	46	40
Labour Cost (₹/u)				
Assembly Dept.	15	20	15	20
Machine Dept.	18	24	36	30
Variable Overheads (₹/u)	6	8	6	8
Contribution (₹/u)	21	15	18	26
Assembly Hours *per unit*	1.5	2	1.5	2
Contribution (₹/hr.)	14	7.5	12	13
Rank [Contribution (₹/hr.)]	I	IV	III	II
Sub-Contract Price (₹/u)	85	95	101	100
Contribution (₹/u) [Sub-Contract]	15	14	20	24

It is more profitable to *sub-contract C*, since contribution is higher in sub -contracting.

Allocation of Assembly Hours *on the basis of ranking*

Produce A *as much as possible*	=	40,000 units
Hours Required	=	60,000 hrs (40,000 units × 1.5 hrs.)
Balance Hours Available	=	1,60,000 hrs (2,20,000 hrs. − 60,000 hrs.)
Produce the Next Best	=	30,000 units of D
Hours Required	=	60,000 hrs (30,000 units × 2 hrs.)
Balance Hours Available	=	1,00,000 hrs (1,60,000 hrs. − 60,000 hrs.)
Produce the Next Best	=	50,000 units of B $\left(\frac{1,00,000 \text{ hrs}}{2 \text{ hrs / u}}\right)$

Statement Showing Profit *on the basis of ranking*

Product	Particulars	Contribution/unit (₹)	Contribution (₹)
A	Produce: 40,000 units	21	8,40,000
	Subcontract: NIL units	15	---
B	Produce: 50,000 units	15	7,50,000
	Subcontract: 5,000 units	14	70,000
C	Produce: NIL units	18	---
	Subcontract: 36,000 units	20	7,20,000
D	Produce: 30,000 units	26	7,80,000
	Subcontract: NIL units	24	---
Total Contribution			31,60,000
Less: Fixed Cost			12,50,000
Net Profit			19,10,000

Decision:

However AXE Ltd. can save fixed cost of ₹ 4,07,000 (₹ 12,50,000 – ₹ 8,43,000) if it keeps its production limited to 1,00,000 units. But in this case AXE Ltd. has to subcontract 20,000 units of B to fulfill maximum market demand. Contribution Lost from subcontracting of 20,000 units is amounting to ₹ 20,000 [20,000 units × (₹ 15 – ₹ 14)]. Hence optimum profit would be ₹ 22,97,000 [₹ 19,10,000 + ₹ 4,07,000 – ₹ 20,000].

Statement Showing Production Vs Sub Contract (units) and Profit – Best Strategy

Prod	Produced [Units]	Sub-Contract [Units]	Contribution [Production] (₹)	Contribution [Sub-Contract] (₹)	Total Contribution (₹)
A	40,000	---	8,40,000	---	8,40,000
B	30,000	25,000	4,50,000	3,50,000	8,00,000
C	---	36,000	---	7,20,000	7,20,000
D	30,000	---	7,80,000	---	7,80,000
Total Contribution					31,40,000
Less: Fixed Cost					8,43,000
Net Profit					22,97,000

(ii) Break Even Point:

Statement Showing Recovery of Fixed Cost

Particulars	Amount (₹)
Fixed Cost (at Best Strategy)	8,43,000
Less: Recovered from Product 'D' (₹26 × 30,000 units)	7,80,000
Balance	63,000
Less: Recovered from Product 'A' $\left(\frac{₹63,000}{₹21} = 3,000 \text{units}\right)$	63,000

Minimum number of units to be produced to achieve break-even point:

Product D = 30,000 units

Product A = 3,000 units

Accordingly, earliest BEP at 33,000 units

(iii) Assembly Labour is Not a Limiting Factor & No Requirement to Fulfill Max. Market Demand:

Statement Showing Comparison of Contribution *per unit*

(Make Vs Sub-Contracting)

	Demand (Units)			
	40,000	55,000	36,000	30,000
	A	B	C	D
Contribution (₹/u) [Make]	21	15	18	26
Contribution (₹/u) [Sub-Contract]	15	14	20	24
Best Strategy	Make	Make	Sub Contracting	Make
Ranking for Production	II	III	---	I

Decision:

From the above comparison table it can be seen manufacturing of product A, B and D gives higher contribution per unit as compared to sub-contracting. Therefore, AXE Ltd. should manufacture the entire quantity of product A, B and D and Subcontract the production of product C. However AXE Ltd. can save fixed cost of ₹4,07,000 (₹12,50,000 − ₹8,43,000) by limiting its production level to 1,00,000 units only. In this case AXE Ltd. will make 30,000 units, 40,000 units and 30,000 units of product D, A and B respectively. But in this case AXE Ltd. has to subcontract 25,000 units of B to earn maximum profit.

Statement Showing Production Vs Sub Contract (units) and Profit – Best Strategy

Prod.	Produced [Units]	Sub-Contract [Units]	Contribution [Production] (₹)	Contribution [Sub-Contract] (₹)	Total Contribution (₹)
A	40,000	---	8,40,000	---	8,40,000
B	30,000	25,000	4,50,000	3,50,000	8,00,000
C	---	36,000	---	7,20,000	7,20,000
D	30,000	---	7,80,000	---	7,80,000
Total Contribution					31,40,000
Less: Fixed Cost					8,43,000
Net Profit					22,97,000

☞ It may not be necessary to prepare 'Statement Showing Production Vs Sub Contract (units) and Profit – Best Strategy' for part (iii), but only relevant figures need to be shown.

(b) The arrival patterns yield the following probability distribution. The numbers 00–99 are allocated in proportion to the probabilities associated with each event.

Random No. Coding for Arrival

No. of Laptops	Probability	Cumulative Probability	Random Numbers
8	0.10	0.10	00 – 09
9	0.25	0.35	10 – 34
10	0.20	0.55	35 – 54
11	0.15	0.70	55 – 69
12	0.18	0.88	70 – 87
13	0.12	1.00	88 – 99

The service patterns yield the following probability distribution. The numbers 00–99 are allocated in proportion to the probabilities associated with each event.

Random No. Coding for Service

No. of Laptops	Probability	Cumulative Probability	Random Numbers
8	0.15	0.15	00 – 14
9	0.20	0.35	15 – 34
10	0.25	0.60	35 – 59
11	0.16	0.76	60 – 75
12	0.14	0.90	76 – 89
13	0.10	1.00	90 – 99

Let us simulate the arrival and service of laptops for the next ten days using the given random numbers / information.

Simulation Sheet

Day	R. No. of Arrival	No. of Laptops Arrived	Opening Job	R. No. of Service	No. of Laptops Serviced*	Closing Job
1	69	11	1	52	10	2
2	45	10	2	36	10	2
3	46	10	2	62	11	1
4	10	9	1	49	10	0
5	82	12	0	68	11	1
6	16	9	1	77	12	0
7	35	10	0	55	10	0
8	70	12	0	66	11	1
9	57	11	1	51	10	2
10	92	13	2	88	12	3
					Total	12

** This represents the service capacity of service centre.*

Average No. of Laptops held for more than one day $= \frac{\text{Total of Closing Jobs}}{\text{No. of Days}}$

$= \frac{12 \text{ Laptops}}{10 \text{ Days}}$

= 1.2 Laptops *per day*

Question 3

(a) *RST Ltd. has provided the following summarized results for two years:*

	Year ended (₹ In lacs)	
	31-03-2013	*31-3-2014*
Sales	*3,000*	*3,277.50*
Material	*2,000*	*2,357.50*
Variable overheads	*500*	*525.00*
Fixed overheads	*300*	*367.50*
Profit	*200*	*27.50*

During the year ended 31-3-2014 sale price has increased by 15% whereas material and overhead prices have increased by 15% and 5% respectively. You are required to analyse the variances of revenue and each element of cost over the year in order to bring out the reasons for the change in profit. Present a profit reconciliation statement starting from profits in 2012-13 showing the factors responsible for the change in profits in 2013-14.

(10 Marks)

(b) *A factory produces 3 products X_1 , X_2 and X_3. Each of these products is processed in two departments, machining and Assembly. The processing time in hours for each product in each department and the total available time in hours in the departments and contribution per unit are given below:*

Product	*Processing time (in hours)*		*Contribution ₹/unit*
	Machining Department	*Assembly Department*	
X_1	*4*	*3*	*8*
X_2	*4*	*2*	*6*
X_3	*6*	*4*	*5*
Available time (hours)	*384*	*288*	

Exactly 30 units of X_3 must be produced.

(i) Determine the optimal product mix using simplex method and find the optimal profit.

(ii) Comment on the solution, objective function and the constraints. *(6 Marks)*

Answer

(a) Statement Showing Reconciliation Between

Budgeted Profit [F.Y. 2012-13] & Actual Profit [F.Y. 2013-14]

Particulars	(₹ in lacs)	(₹ in lacs)
Budgeted Profit		200.00
Sales Margin Variances:		
Price	427.50 (F)	
Volume	10.00 (A)	417.50 (F)
Direct Material Variances:		
Price	307.50 (A)	
Usage	150.00 (A)	457.50 (A)
Variable Overheads Variances:		
Expenditure	25.00 (A)	
Efficiency	25.00 (A)	50.00 (A)
Fixed Overheads Variances:		
Expenditure	67.50 (A)	
Volume	15.00 (A)	82.50 (A)
Actual Profit		27.50

Computation of Variances (₹ In Lacs)

Sales Variances

Price Variance = Actual Sales – Standard Sales

= ₹3,277.50 – ₹2,850.00

= ₹427.50 (F)

Volume Variance = Standard Sales – Budgeted Sales

= ₹2,850.00 – ₹3,000.00

= ₹150 (A)

Sales Margin Variances

Sales Margin Price Variance = Sales Price Variance

= ₹427.50 (F)

Sales Margin Volume Variance = Sales Volume Variance × Budgeted Net Profit Ratio

$= ₹150 \text{ (A)} \times \left(\frac{₹200}{₹3,000}\right)$

= ₹10 (A)

Material Variances

Material Price Variance = Standard Cost of Actual Quantity – Actual Cost

= ₹2,050.00 – ₹2,357.50

= ₹307.50 (A)

Material Usage Variance = Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity

= ₹1,900 – ₹2,050

= ₹150 (A)

Variable Overhead Variances

Expenditure Variance = Budgeted Variable Overheads for Actual Hours – Actual Variable Overheads

Or

= Std. Rate *per unit* × Expected Output for Actual Hours Worked – Actual Variable Overheads

= ₹500 – ₹525

= ₹25 (A)

Efficiency Variances = Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual Hours

Or

= Std. Rate *per unit* × Actual Output – Std. Rate *per unit* × Expected Output for Actual Hours Worked

= ₹475 – ₹500

= ₹25 (A)

Fixed Overhead Variances

Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overheads.

= ₹300.00 – ₹367.50

= ₹67.50 (A)

Volume Variance = Absorbed Fixed Overheads – Budgeted Fixed Overheads
= ₹285 – ₹300 = ₹15 (A)

Working Notes (₹ in lacs)

Note-1:

Sales in F.Y. 2013-2014	3,277.50
Less: Increase due to *price rise* [₹3,277.50 lacs × 15/115]	427.50
Sales in F.Y. 2013-2014 at F.Y. 2012-2013 Prices [Standard Sales]	2,850.00
Sales in F.Y. 2012-2013	3,000.00
Fall in Sales in F.Y. 2013-2014 [₹3,000 lacs − ₹2,850 lacs]	150.00
Percentage fall	5%

Note-2:

Material Cost In F.Y. 2012-2013	2,000.00
Less: 5% for Decrease in Volume	100.00
'Standard Material Usage' at F.Y. 2012-13 Prices (Standard Cost of Standard Quantity for Actual output)	1,900.00
Actual Material Cost F.Y. 2013-2014 *Less:* 15% Increase in Prices [₹2,357.50 lakhs × 15/115]	2,357.50 307.50
Actual Materials Used, at F.Y. 2012-2013 Prices (Standard Cost of Actual Quantity)	2,050.00

Note-3:

Variable Overheads Cost in F.Y. 2012-13	500.00
Less: 5% due to fall in Volume of Sales in F.Y. 2013-14	25.00
"Standard Overheads for Production" in F.Y. 2013-14	475.00
Actual Variable Overheads Incurred in F.Y. 2013-14	525.00
Less: 5% for Increase in Price [₹525 lacs × 5 / 105]	25.00
Amount Spent in F.Y. 2013-14 at F.Y. 2012-13 Prices (Budgeted Variable Overheads for Actual Hours)	500.00

Note-4:

Fixed Overheads Cost in F.Y. 2012-13	300.00
Less: 5% due to fall in Volume of Sales in F.Y. 2013-14	15.00
"Standard Overheads for Production" in F.Y. 2013-14. (Absorbed Fixed Overheads)	285.00

☞ This question can also be solve by '**Contribution**' approach.

(b) (i) Let x_1, x_2, and x_3 represent the number of units of products X_1, X_2 and X_3 respectively then the mathematical formulation of the linear programming problem based on the above data will be as follows:

Maximize

$Z = 8x_1 + 6x_2 + 5x_3$

Subject to the Constraints:

$4x_1 + 4x_2 + 6x_3 \leq 384$

$3x_1 + 2x_2 + 4x_3 \leq 288$

$x_3 = 30$

$x_1, x_2, x_3 \geq 0$

Or

Maximize

$Z = 8x_1 + 6x_2 + 5 \times 30$

Subject to the Constraints:

$4x_1 + 4x_2 + 6 \times 30 \leq 384$

$3x_1 + 2x_2 + 4 \times 30 \leq 288$

$x_1, x_2 \geq 0$

Or

Maximize

$Z = 8x_1 + 6x_2 + 150$

Subject to the Constraints:

$4x_1 + 4x_2 \leq 204$

$3x_1 + 2x_2 \leq 168$

$x_1, x_2 \geq 0$

By introducing slack variables in the above constrains, we get:

Maximize

$Z = 8x_1 + 6x_2 + 150 + 0s_1 + 0s_2$

Subject to:

$4x_1 + 4x_2 + s_1 = 204$

$$3x_1 + 2x_2 + s_2 = 168$$

$$x_1, x_2, s_1, s_2 \geq 0$$

We shall prepare the simplex tableau as follows:

SIMPLEX TABLEAU-I

$C_j \rightarrow$			8	6	0	0	Min. Ratio
C_B	Basic Variable (B)	Value of Basic Variables b(=X_B)	x_1	x_2	s_1	s_2	
0	s_1	204	4	4	1	0	←51
0	s_2	168	3	2	0	1	56
		$Z_j = \sum C_{Bi}X_j$	0	0	0	0	
		$C_j - Z_j$	8↑	6	0	0	

SIMPLEX TABLEAU-II

$C_j \rightarrow$			8	6	0	0
C_B	Basic Variable (B)	Value of Basic Variables b(=X_B)	x_1	x_2	s_1	s_2
8	x_1	51	1	1	1/4	0
0	s_2	15	0	−1	−3/4	1
		$Z_j = \sum C_{Bi}X_j$	8	8	2	0
		$C_j - Z_j$	0	−2	−2	0

Since all numbers in the $C_j - Z_j$ row are either negative or zero, the optimum solution to the given problem has been obtained and is given by $x_1 = 51$ units, $x_2 = 0$ units and $x_3 = 30$ units (already given).

Maximum Contribution = ₹8 × 51 units + ₹6 × 0 units + ₹5 × 30 units = ₹558

(ii) Solution, Objective Function and The Constraints

'When a *non basic variable* in the final tableau (showing optimal solution) to a problem has a *net zero contribution* then optimal solution to given problem is not one but *multiple*'

and

Multiple optimal solutions can occur when the *objective function parallel to a constraint*.

In the above case x_2 and s_1 are non basic variables in the optimal table (Simplex Tableau-II) and have $C_j - Z_j \neq 0$. Hence, LPP has no multiple optimal solutions. Accordingly *objective function* is also not parallel to *constraint*.

☞ This question can also be solve by taking 'Artificial Variable' for Equation $x_3 = 30$.

Question 4

(a) *PQR Ltd. specializes in the distribution of pharmaceutical products. It buys from pharmaceutical companies and resells to each of the three different markets:*

(i) General Supermarket Chains

(ii) Drug Store Chains

(iii) Chemist Shops

The company plans to use activity based costing for analyzing the profitability of its distribution channels. The following data for the quarter ending March 2014 is given:

	General Supermarket Chains	*Drug Store Chains*	*Chemist Shop*
Average sales per delivery	*₹ 96,500*	*₹ 32,450*	*₹ 6,225*
Average cost of goods sold per delivery	*₹ 94,650*	*₹ 31,800*	*₹ 5,950*
Number of deliveries	*960*	*2,470*	*8,570*
Total number of orders	*1,000*	*2,650*	*9,500*
Average number of cartons shipped per delivery	*250*	*75*	*12*
Average number of hours of shelf stocking per delivery	*2*	*0.5*	*0.1*

The following information is available in respect of operating costs (other than cost of goods sold) for the quarter ending March 2014:

Activity Area	*Cost Driver*	*Total Cost (₹)*
Customer purchase order processing	*Purchase order by customers*	*5,91,750*
Customer store delivery	*Number of deliveries*	*9,60,000*
Cartons dispatched to customer stores	*Number of Cartons dispatched to customer stores*	*7,92,135*
Shelf stocking at customer store	*Hours of shelf stocking*	*80,240*

Compute the operating income of each distribution channel for the quarter ending March 2014 using activity based costing. *(8 Marks)*

(b) The following table relates to a network:

Activity	*Normal Time (Days)*	*Crash Time (Days)*	*Normal Cost (₹)*	*Crash (₹)*
1-2	*5*	*4*	*30,000*	*40,000*
2-3	*6*	*4*	*48,000*	*70,000*
2-4	*8*	*7*	*1,25,000*	*1,50,000*
2-5	*9*	*6*	*75,000*	*1,20,000*
3-4	*5*	*4*	*82,000*	*1,00,000*
4-5	*7*	*5*	*50,000*	*84,000*

The overhead cost per day is ₹ 5,000 and the contract includes a penalty clause of ₹ 15,000 per day if the project is not completed in 20 days.

(i) Draw the network and calculate the normal duration and its cost.

(ii) Find out:

(1) the lowest cost and the associated time.

(2) the lowest time and the associated cost.

Answer

(a) Statement Showing Operating Income of Distribution Channels of PQR Ltd.

Particulars	General Supermarket Chains (₹)	Drug Store Chains (₹)	Chemist Shops (₹)	Total (₹)
Sales (Number of Deliveries × Average Sales *per delivery*)	9,26,40,000 (960 × ₹96,500)	8,01,51,500 (2,470 × ₹32,450)	5,33,48,250 (8,570 × ₹6,225)	22,61,39,750
Less: Cost of Goods Sold (Number of Deliveries × Average Cost of Goods Sold *per delivery*)	9,08,64,000 (960 × ₹94,650)	7,85,46,000 (2,470 × ₹31,800)	5,09,91,500 (8,570 × ₹5,950)	22,04,01,500
Gross Margin	17,76,000	16,05,500	23,56,750	57,38,250
Less: Operating Costs	5,20,200	6,19,425	12,84,500	24,24,125
Operating Income	12,55,800	9,86,075	10,72,250	33,14,125

Workings:

Statement Showing Operating Cost of Distribution Channels of PQR Ltd.

Particulars	General Supermarket Chains (₹)	Drug Store Chains (₹)	Chemist Shops (₹)	Total (₹)
Customer Purchase Order Processing	45,000 (₹45 × 1,000)	1,19,250 (₹45 × 2,650)	4,27,500 (₹45 × 9,500)	5,91,750
Customer Store Delivery	76,800 (₹80 × 960)	1,97,600 (₹80 × 2,470)	6,85,600 (₹80 × 8,570)	9,60,000
Cartons Dispatched to Customer Stores	3,60,000 (₹1.5 × 2,40,000)	2,77,875 (₹1.5 × 1,85,250)	1,54,260 (₹1.5 × 1,02,840)	7,92,135
Shelf Stocking at Customer Store	38,400 (₹20 × 1,920)	24,700 (₹20 × 1,235)	17,140 (₹20 × 875)	80,240
	5,20,200	6,19,425	12,84,500	24,24,125

Computation of Rate Per Unit of Cost Allocation Base

Activity	Activity Cost [a] (₹)	Activity Driver	No. of Units of Activity Driver [b]	Cost Driver Rate [a] / [b] (₹)
Customer Purchase Order Processing	5,91,750	Purchase Order by Customers	13,150	45.00
Customer Store Delivery	9,60,000	Number of Deliveries	12,000	80.00
Cartons Dispatched to Customer Stores	7,92,135	Number of Cartons Dispatched to Customer Stores	5,28,090	1.50
Shelf Stocking at Customer Store	80,240	Hours of Shelf Stocking	4,012	20.00

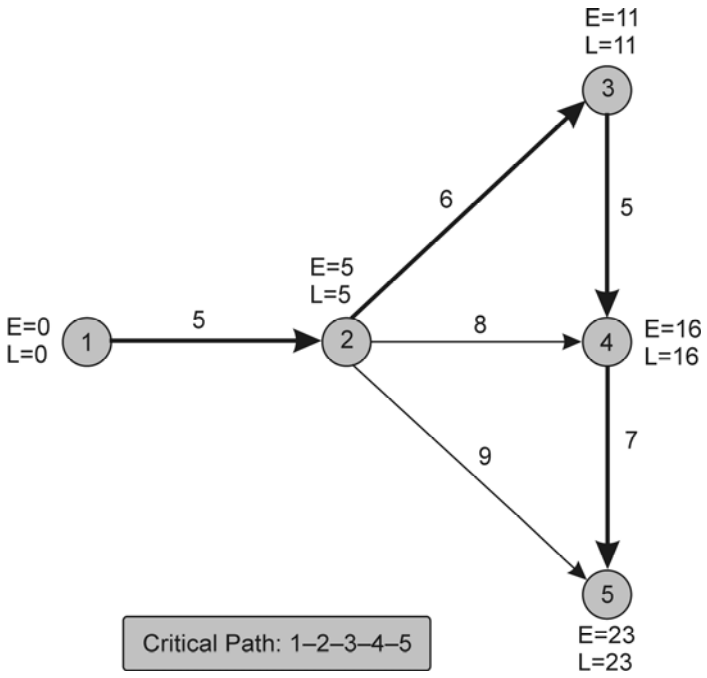
No. of Units of Activity Driver

Purchase Order by Customers = 1,000 + 2,650 + 9,500

= 13,150

Number of Deliveries	=	960 + 2,470 + 8,570
	=	12,000
Number of Cartons Dispatched to Customer Stores	=	Number of Deliveries × Average Number of Cartons Shipped *per delivery*
	=	(960 × 250) + (2,470 × 75) + (8,570 × 12)
	=	2,40,000 + 1,85,250 + 1,02,840
	=	5,28,090
Hours of Shelf Stocking	=	Number of Deliveries × Average Number of Hours of Shelf Stocking *per delivery*
	=	(960 × 2.0) + (2,470 × 0.5) + (8,570 × 0.1)
	=	1,920 + 1,235 + 857
	=	4,012

(b) (i) The network for the given problem



Normal Duration = 23 Days

Associated Cost = ₹5,70,000

(Refer Statement Showing Project Cost & Duration)

(ii) Lowest Cost = ₹ 5,42,000

Associated Time = 20 Days

(Refer Statement Showing Project Cost & Duration)

Lowest Time = 17 Days

Associated Cost = ₹ 5,79,000

(Refer Statement Showing Project Cost & Duration)

Workings:

Statement Showing Project Cost & Duration

Project Length Days	Job Crashed	Crashing Cost	Normal Cost	Indirect Cost	Penalty	Total Cost
23	–	–	₹4,10,000	₹1,15,000 (₹5,000 × 23 Days)	₹45,000 (₹15,000 × 3 Days)	₹5,70,000
22	1–2	₹10,000 (₹10,000 × 1 Day)	₹4,10,000	₹1,10,000 (₹5,000 × 22 Days)	₹30,000 (₹15,000 × 2 Days)	₹5,60,000
20	2–3	₹32,000 (₹10,000 + ₹11,000 × 2 Days)	₹4,10,000	₹1,00,000 (₹5,000 × 20 Days)	₹0 (₹15,000 × 0 Days)	₹5,42,000
18	4–5	₹66,000 (₹32,000 + ₹17,000 × 2 Days)	₹4,10,000	₹90,000 (₹5,000 × 18 Days)	₹0 (₹15,000 × 0 Days)	₹5,66,000
17	3–4	₹84,000 (₹66,000 + ₹18,000 × 1 Day)	₹4,10,000	₹85,000 (₹5,000 × 17 Days)	₹0 (₹15,000 × 0 Days)	₹5,79,000

Statement Showing Cost Slope of *each activity*

Activity	Normal		Crash		Cost Slopes		
	Duration (Days)	Cost (₹)	Duration (Days)	Cost (₹)	ΔT (Days)	ΔC (₹)	ΔC/ΔT (₹)
1-2	5	30,000	4	40,000	1	10,000	10,000
2-3	6	48,000	4	70,000	2	22,000	11,000
2-4	8	1,25,000	7	1,50,000	1	25,000	25,000
2-5	9	75,000	6	1,20,000	3	45,000	15,000
3-4	5	82,000	4	1,00,000	1	18,000	18,000
4-5	7	50,000	5	84,000	2	34,000	17,000
Total		4,10,000					

Question 5

(a) *Divisions X and Y are two divisions in XY Ltd. Division X manufactures a component (X) which is sold to external customers and also to Division Y.*

Details of Division X are as follows:

Market price per component	*₹ 300*
Variable cost per component	*₹ 157*
Fixed costs per production period	*₹ 20,62,000*
Demand from Y Division per production period	*20,000 components*
Capacity per production period	*35,000 components*

Division Y assembles a product (Y) which is sold to external customers. Each unit of Y requires two units of X.

Details of Division Y are as follows:

Selling price per unit	*₹ 1,200*
Variable cost per unit:	
(i) Two components from X	*2@ transfer price*
(ii) Other variable costs per unit	*₹ 375*
Fixed costs per production period	*₹ 13,50,000*
Demand per production period	*10,000 units*
Capacity per production period	*10,000 units*

The Group Transfer Pricing Policy stipulates that

Transfers must be at opportunity cost.

Y must buy the components from X.

X must satisfy the demand from Y before making external sales.

(i) *Present figures showing the weighted average transfer price, per component transferred to Y and the total profits earned by X for each of the following levels of external demand of X:*

External demand = 15,000 components

External demand = 19,000 components

External demand = 35,000 components

(ii) *Compute Division Y's profits when Division X has each of the above levels of demand.*

(Only relevant figures need to be discussed. A detailed profitability statement for each situation is not required). *(8 Marks)*

(b) *Buildico, a company that builds houses presents the following facts relating to a certain housing contract that it wishes to undertake:*

The CEO's and Marketing Director's food and hotel expenses of ₹ 3,750 were incurred for a meeting with a prospective client.

1,200 kgs of raw material Z will be required for the house. Inventory of Z available is 550 kg. It was purchased at ₹ 580 per kg. It is used by Buildico in other projects. Its current market price is ₹ 650 per kg. Its resale value is ₹ 350 per kg.

The house will require 90 hours of engineer's time. The engineers are paid a fixed monthly salary of ₹ 47,500 per engineer who can work 150 hours a month. Spare time is not available now and an engineer has to be hired for this house for one month. He cannot be used in any other project once he does this contract.

Buildico will use a special earthquake proof foundation material. This was developed by Buildico at a cost of ₹ 30,000 for some other project that had to be abandoned. If it does not use it in this project, it can use it in some other project and charge the client ₹ 50,000 for it.

A list of items is given below. You are required to name the type of cost and state whether it is relevant or not in calculating the cost of the given housing project:

S. No.	*Item*	*Type of Cost*	*Relevant (R)/ Irrelevant (IR)*
1	*Food and hotel expenses ₹ 3,750*		
2. (i)	*Material Z : 550 kg × ₹ 580/kg*		
(ii)	*Material Z : 550 kg × ₹ 650 per kg*		
3. (i)	*Engineer's salary ₹ 47,500*		
(ii)	*Engineer's free time cost* $\frac{60}{150} \times$ *₹ 47,500*		
4. (i)	*Design cost ₹ 30,000*		
(ii)	*Design cost ₹ 50,000*		

(8 Marks)

Answer

(a) (i) Computation of Weighted Average Transfer Price

Particulars	External Demand 15,000 Components	External Demand 19,000 Components	External Demand 35,000 Components
Component's Transfer Price	Variable Cost	Variable Cost *plus* Opportunity Cost for	Variable Cost *plus* Opportunity Cost for

(Base)		4,000 Components	20,000 Components
Variable Cost	₹157.00	₹157.00	₹157.00
Opportunity Cost	0	₹28.60 $\left(\frac{4,000}{20,000}\times₹143\right)$	₹143.00 $\left(\frac{20,000}{20,000}\times₹143\right)$
Transfer Price	₹157.00	₹185.60	₹300.00

Opportunity Cost for a Component is the Contribution *forgone* by not Selling it to the market.

Contribution = Market Selling Price – Variable Cost

= ₹300 – ₹157 = ₹143

Statement Showing Profitability of Division- X

Particulars	External Demand 15,000 Components (₹)	External Demand 19,000 Components (₹)	External Demand 35,000 Components (₹)
Sales :			
Division-Y	31,40,000 (₹157 × 20,000)	37,12,000 (₹185.60 × 20,000)	60,00,000 (₹300 × 20,000)
Market	45,00,000 (₹300 × 15,000)	45,00,000 (₹300 × 15,000)	45,00,000 (₹300 × 15,000)
Total Revenue	76,40,000	82,12,000	1,05,00,000
Less: Variable Cost (₹157 × 35,000)	54,95,000	54,95,000	54,95,000
Less: Fixed Cost	20,62,000	20,62,000	20,62,000
Profit	83,000	6,55,000	29,43,000

(ii) Statement Showing Profitability of Division- Y

Particulars	External Demand 15,000 Components (₹)	External Demand 19,000 Components (₹)	External Demand 35,000 Components (₹)
Selling Price *per unit*	1,200.00	1,200.00	1,200.00
Less: Variable Cost *per unit:*	314.00 (₹157 × 2)	371.20 (₹185.60 × 2)	600.00 (₹300 × 2)

Component –X			
Others	375.00	375.00	375.00
Contribution *per unit*	511.00	453.80	225.00
No. of units	10,000	10,000	10,000
Total Contribution	51,10,000	45,38,000	22,50,000
Less: Fixed Cost	13,50,000	13,50,000	13,50,000
Profit	37,60,000	31,88,000	9,00,000

(b)

Sl. No.	Item	Type of Cost	Relevant (R) / Irrelevant (IR)
1	Food and hotel expenses ₹3,750	Sunk Cost	Irrelevant
2(i)	Material Z: 550 kg × ₹580/kg	Historical Cost / Sunk Cost	Irrelevant
(ii)	Material Z: 550 kg × ₹650 per kg	Replacement Cost	Relevant
3(i)	Engineer's salary ₹47,500	Period Cost	Relevant
(ii)	Engineer's free time cost 60/ 150 × ₹47,500	Committed Cost / Unavoidable Cost	Irrelevant
4(i)	Design cost ₹30,000	Sunk Cost	Irrelevant
(ii)	Design cost ₹50,000	Opportunity Cost	Relevant

Question 6

(a) *DEF Ltd manufactures and sells a single product and has estimated sales revenue of ₹ 397.80 lacs during the year based on 20% profit on selling price. Each unit of product requires 6 kg of material A and 3 kg of material B and processing time of 4 hours in machine shop and 2 hours in assembly shop. Factory overheads are absorbed at a blanket rate of 20% of direct labour. Variable selling & distribution overheads are ₹ 6 per unit sold and fixed selling & distribution overheads are estimated to be ₹ 7,20,000.*

The other relevant details are as under:

Purchase Price	*Material A*	*₹ 16 per kg*
	Materials B	*₹ 10 per kg*
Labour Rate	*Machine Shop*	*₹ 14 per hour*
	Assembly Shop	*₹ 7 per hour*

	Finished Stock	*Material A*	*Material B*
Opening Stock	*25,000 units*	*75,000 kg*	*40,000 kg*
Closing Stock	*30,000 units*	*80,000 kg*	*55,000 kg*

You are required to calculate:

(i) Number of units of product proposed to be sold and selling price per unit.

(ii) Production budget in units.

(iii) Material purchase budget in units. *(7 Marks)*

(b) Y Limited is a manufacturer of Cardboard boxes. An analysis of its operating income between 2012 and 2013 shows the following:

	Income Statement (amount in 2012)	*Revenue & Cost effect of Growth component in 2013*	*Revenue & Cost effect of Price recovery component in 2013*	*Cost effect of productivity component in 2013*	*Income Statement (amount in 2013)*
Revenue (₹)	*40,00,000*	*2,00,000(F)*	*4,20,000(F)*	*-*	*46,20,000*
Cost (₹)	*29,20,000*	*60,000 (A)*	*2,56,000(A)*	*58,000(F)*	*31,78,000*
Operating Income (₹)	*10,80,000*	*1,40,000(F)*	*1,64,000(F)*	*58,000(F)*	*14,42,000*

Y limited sold 4,00,000 boxes and 4,20,000 boxes in 2012 and 2013 respectively. During 2013 the market for cardboard boxes grew 3% in terms of number of units and all other changes are due to company's differentiation strategy and productivity. Compute how much of the change in operating income from 2012 to 2013 is due to the industry market size factor, productivity and product differentiation and also reconcile the profit of both years due to these factors. *(5 Marks)*

(c) Can there be (i) more than one dummy row or column or (ii) one dummy row and a dummy column in a given problem of (a) assignment (b) transportation? Why? (In other words, state whether and why each of situations A, B, C and D is possible or not):

	Assignment	*Transportation*
More than one dummy row or column	*A*	*B*
One dummy row and one dummy column	*C*	*D*

(4 Marks)

Answer

(a) (i) Workings:

Statement Showing Total Variable Cost *for the year*

Particulars	Amount (₹)
Estimated Sales Revenue	3,97,80,000
Less: Desired Profit Margin on Sale @ 20%	79,56,000

Estimated Total Cost	3,18,24,000
Less: Fixed Selling and Distribution Overheads	7,20,000
Total Variable Cost	3,11,04,000

Statement Showing Variable Cost per unit

Particulars	Variable Cost p.u. (₹)
Direct Materials:	
A: 6 Kg. @ ₹16 per Kg.	96
B: 3 Kg. @ ₹10 per Kg.	30
Labour Cost:	
Machine Shop: 4 hrs. @ ₹14 per hour	56
Assembly Shop: 2 hrs. @ ₹7 per hour	14
Factory Overheads: 20% of (₹56 + ₹14)	14
Variable Selling & Distribution Expenses	6
Total Variable Cost *per unit*	216

Number of Units Sold = Total Variable Cost / Variable Cost *per unit*
= ₹3,11,04,000 / ₹216
= 1,44,000 units

Selling Price *per unit* = Total Sales Value / Number of Units Sold
= ₹3,97,80,000 / 1,44,000 units
= ₹276.25

(ii) Production Budget (units)

Particulars	Units
Budgeted Sales	1,44,000
Add: Closing Stock	30,000
Total Requirements	1,74,000
Less: Opening Stock	25,000
Required Production	1,49,000

(iii) Materials Purchase Budget (Kg.)

Particulars	Material A	Material B
Requirement for Production	8,94,000 (1,49,000 units × 6 Kg.)	4,47,000 (1,49,000 units × 3 Kg.)
Add: Desired Closing Stock	80,000	55,000
Total Requirements	9,74,000	5,02,000
Less: Opening Stock	75,000	40,000
Quantity *to be purchased*	8,99,000	4,62,000

(b) Reconciliation of Operating Income

Particulars	Amount (₹)
Operating Income in 2012	10,80,000
Add: Change Due to Industry Market Size Factor (W.N.-1)	84,000
Changes Due to Productivity (W.N.-2)	58,000
Changes Due to Product Differentiation (W.N.-3)	2,20,000
Operating Income in 2013	14,42,000

Workings:

Total Increase in Sale of Cardboard Boxes 20,000 Boxes (4,20,000 Boxes – 4,00,000 Boxes). Out of this increase in Sales of 20,000 Boxes,12,000 Boxes (3% of 4,00,000) is due to *growth in market size*, and the remaining 8,000 Boxes (20,000 Boxes – 12,000 Boxes) are due to an increase in *market share* .

W.N.1 Effect of the Industry Market Size Factor *on operating income*:

= Revenue and Cost Effect of Growth Component in 2013 ×

$$\frac{\text{Increase in Sales Unit Due to Market Growth}}{\text{Total Growth in Sales Unit (from 2012 to 2013)}}$$

$$= ₹\ 1,40,000 \times \frac{12,000\ \text{Boxes}}{20,000\ \text{Boxes}}$$

= ₹ 84,000 (F)

W.N.2. Effect of Productivity *on operating income*:

= Cost Effect of Productivity Component in 2013

= ₹58,000 (F)

W.N.3 Effect of Product Differentiation *on operating income*:

Particulars	Amount (₹)
Increase in the Selling Price (Revenue Effect of the Price Recovery Component)	4,20,000 (F)
Increase in Prices of Inputs (Cost Effect of the Price Recovery Component)	2,56,000 (A)
Growth in Market Share Due to Product Differentiation* $\left(₹\ 1,40,000 \times \frac{8,000\ \text{Boxes}}{20,000\ \text{Boxes}}\right)$	56,000 (F)
Total	2,20,000 (F)

* Revenue and Cost Effect of Growth Component in 2013 ×

$$\frac{\text{Increase in Sales Unit Due to Product Differentiation}}{\text{Total Growth in Sales Unit (from 2012 to 2013)}}$$

(c)

Situation	Assignment	Transportation
More than one Dummy row or column	A: Possible Reason: In assignment problem, the pay off matrix should be square matrix i.e. no. of rows should be equal to no. of column. In case of unbalanced assignment problem where pay off matrix is not square matrix, either dummy rows or dummy columns, which may be one or more than one, would be added to make it a square matrix.	B: Not Possible Reason: Requirement to solve a transportation problem is that the problem should be balanced i.e. total capacity (or supply) should be equal to total requirement (or demand). In case of a unbalanced transportation problem, a dummy destination or a dummy origin in form of either only one dummy row or one dummy column is introduced in the transportation table to absorb excess capacity or excess demand and to find solution
One Dummy row and one Dummy column	C: Not Possible Reason: As explained in situation- A either dummy rows or dummy columns would be added to transform unbalanced payoff matrix into square matrix, both row and column cannot be added together otherwise problem would remain unbalanced, thus remain unsolved.	D: Not Possible Reason: In case of unbalanced transportation problem, there would be mismatch of demand and supply. To solve this one problem, either one dummy row or one dummy column is required to absorb either excess demand or excess supply.

☞ Conceptually correct brief reason along with the possibility of situation (Possible or Not Possible) is sufficient.

Question 7

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

(a) *How is Pareto analysis helpful in pricing of products in the case of a firm dealing with multiple products?*

(b) *Discuss the benefits of Customer Profitability Analysis.*

(c) *Classify the following items appropriately under the three measures used in the Theory of Constraints:*

- *(i) Research and Development Cost*
- *(ii) Rental/Utilities*
- *(iii) Finished Goods Inventory*
- *(iv) Depreciation*
- *(v) Labour Cost*
- *(vi) Stock of Raw Materials*
- *(vii) Sales*
- *(viii) Cost of Equipment and Buildings*

(d) *Will the solution for a minimization problem obtained by Vogel's Approximation Method and Least Cost Method be the same? Why?*

(e) *In a 3 x 4 transportation problem for minimizing costs, will the R_2C_1 cell (at the intersection of the 2nd row and 1st column) always figure in the initial solution by the North West Corner Rule? Why?* *(4 x 4 = 16 Marks)*

Answer

(a) Role of Pareto Analysis in Pricing of Product *in the case of firm dealing with multiple products*

In the case of firm dealing with multi products, it would not be possible for it to analyse price-volume relationship for all of them. Pareto Analysis is used for analysing the firm's estimated sales revenue from various products and it might indicate that approximately 80% of its total sales revenue is earned from about 20% of its products. Such analysis helps the top management to delegate the pricing decision for approximately 80% of its products to the lower level of management, thus freeing them to concentrate on the pricing decisions for products approximately 20% of which is essential for the company's survival. Thus, a firm can adopt more sophisticated pricing methods for small proportion of products that jointly account for 80% of total sales revenue. For the remaining 80%

products, which account for 20% of the total sales value the firm may use cost based pricing method.

(b) Benefits of Customer Profitability Analysis

(i) It helps the supplier to identify which customers are eroding overall profitability and which customers are contributing to it.

(ii) It can help to provide a basis for constructive dialogue between buyer and seller to improve margins.

(iii) It enhances decision making related to customers.

(iv) It helps in effective cost reporting, communication and information.

(v) It helps to find out the value and profitability of each customer segment.

(c)

Three Measures of Theory of Constraints	Item
Throughput Contribution	(vii) Sales
Investments	(i) Research and Development Cost
	(iii) Finished Goods Inventory
	(vi) Stock of Raw material
	(viii) Cost of Equipment and Building
Operating Costs	(ii) Rent/Utilities
	(iv) Depreciation
	(v) Labour Cost

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

Vogel's Approximation Method (VAM) uses the differences between the minimum and the next minimum costs for each row and column. This is the penalty or opportunity cost of not utilising the next best alternative. The highest penalty is given the 1st preference. This need not be the lowest cost.

For example if a row has minimum cost as 2, and the next minimum as 3, penalty is 1; whereas if another row has minimum 4 and next minimum 6, penalty is 2, and this row is given preference. But Least Cost Method gives preference to the lowest cost cell, irrespective of the next cost. Solution obtained using Vogel's Approximation Method is more optimal than Least Cost Method.

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

(e) The Initial solution obtained by the North-West Corner Rule in transportation need not always contain the R_2C_1 cell. In the North-West Corner Rule the first allocation is made at R_1C_1 cell and then it only moves towards R_2C_1 cell when the resources at the first row

i.e. R_1 is exhausted first than the resources of first column i.e. C_1. On the contrary if resources at first column i.e. C_1 is exhausted first then the next allocation will be at R_1C_2.

For example the resource availability at first row (R_1) is 1,500 units and the demand in first column (C_1) is 1,000 units. In this case resource availability of first row (R_1) will be exhausted to the extent of the demand in first column (C_1) first and then the remaining resource availability at first row (R_1) will be used to meet the demand of the second column (C_2). In this example cell R_2C_1 will not come in initial solution obtained by the North-West Corner Rule.