

Gurukripa's Guideline Answers to May 2014 Exam Questions CA Final ADVANCED MANAGEMENT ACCOUNTING

Question No.1 is compulsory (4 X 5 = 20 Marks).

Answer **any five** questions from the **remaining six** questions (16 X 5 = 80 Marks). [Answer any 4 out of 5 in Q.7]

- Working Notes form part of the Answer. No Statistical or other Table will be distributed along with this Question Paper.
- In theory questions where situations are given, Candidates are not expected to copy the situations into the answer books.

Note: All Page Numbers and Question Numbers References given in the solutions here, are from Padhuka's A Ready Referencer on Advanced Management Accounting – For CA Final

Question 1(a): Pricing of Export Order

(5 Marks)

PQR Ltd, a manufacturer of tool kits has just completed XY's domestic order of 100 kits at a price of ₹ 1650 per kit. The details of cost for XY's order are:

Particulars	₹
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 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).

Solution:

Refer Principles in Page No.4.1 to 4.7, Relevant Cost Analysis.

Particulars	₹ per Kit
Given Sale Price for Export Order	1,600
Less: Profit (10%)	(160)
Hence, Required Total Cost per Kit [A]	1,440
Material Cost per kit = $\frac{90,000}{100}$	900
Direct Labour per kit = $\frac{32,000}{100}$	320
Tools and Consumables (only variable portion) = $\frac{16,400 - 10,000}{100}$	64
Variable Overhead = $\frac{9,600}{100}$	96
Packaging Cost (given)	20
Total Variable Cost per kit [B]	1,400

Hence, Permissible Inspection Cost per kit = A – B = ₹ 1,440 – ₹ 1,400 = ₹ 40 per kit.

Hence, Total Inspection Cost that can be incurred for 300 kits = ₹ 40 × 300 = ₹ 12,000.

Note: Tools & Consumables ₹ 10,000 already incurred = historical and irrelevant.
Allocation of Fixed Overheads ₹ 25,000 is an apportionment and hence irrelevant.

Revised Price without Inspection Cost:

- Since Profit = 10%, i.e. $1/10^{\text{th}}$ on Sales, it is $1/9^{\text{th}}$ of ₹ 1,400 = ₹ 155.56.
- So, Revised Sale Price = Cost + Profit = ₹ 1,400 + ₹ 155.56 = ₹ 1,555.56.
- So, Percentage of Discount = $\frac{₹ 1600 - ₹ 1,555.56}{₹ 1,600} = 2.78\%$.

Question 1(b): Sale at Split Off vs Further Processing – Incremental Approach (5 Marks)

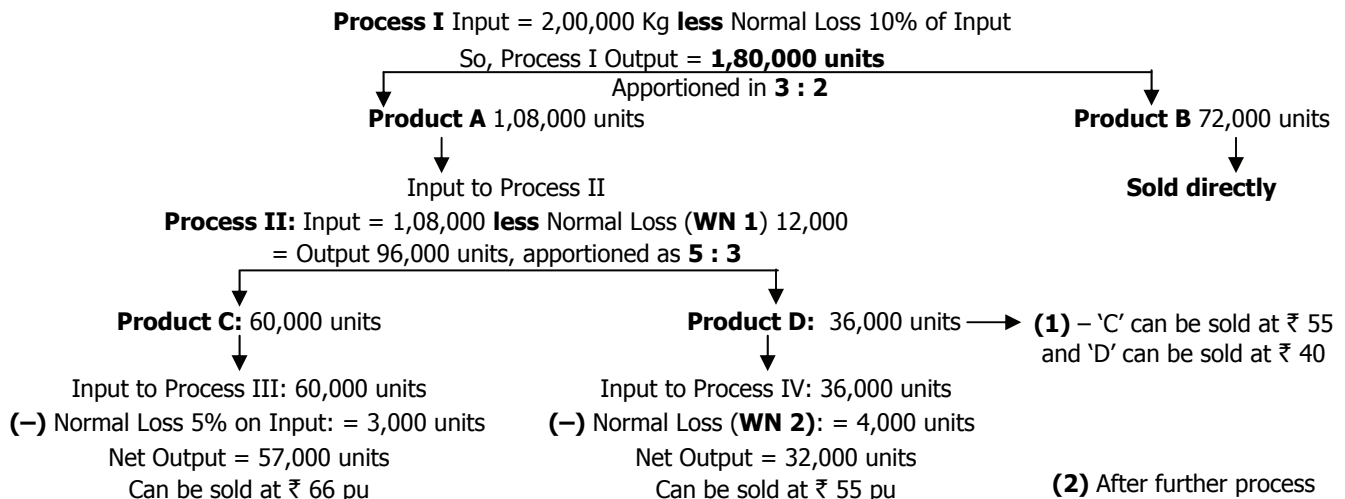
A Company processes different products from a certain Raw Material. The Raw Material is processed in Process I (where Normal Loss is 10% of Input) to give products A and B in the ratio 3:2. B is sold directly. A is processed further in Process II (where Normal Loss is 12.5% of Output) to give Products 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.

Solution:

Similar to Page No.4.13, Illustration 10, N 11 Qn.

1. Process Flow Diagram



Note 1: Normal Loss of Process II = 12.5% on Output = $1,08,000 \times \frac{12.5\%}{112.5\%} = 12,000 \text{ units}$.

Note 2: Normal Loss of Process IV = 12.5% on Output = $36,000 \times \frac{12.5\%}{112.5\%} = 4,000 \text{ units}$

Evaluation of Further Processing

Particulars	Product C	Product D
Sale Value after further processing (2)	$57,000 \times 66 = 37,62,000$	$32,000 \times 55 = 17,60,000$
Less: Sale Value before Process III and IV (1)	$60,000 \times 55 = 33,00,000$	$36,000 \times 40 = 14,40,000$
Incremental Sale Revenue	4,62,000	3,20,000
Less: Incremental Processing Cost (given)	(3,95,600)	(3,82,500)
Net Incremental Benefit / (Cost)	66,400	(62,500)
Decision	Process further in Process III	Sell at split of in Process II

Question 1(c): TQM – 6Cs – Application**(5 Marks)**

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.

Issue	Answer [See Page 11.4, Q.No.6]
1. Some Departments serve both the external and internal customers. These Departments have been advised to focus on satisfying the needs of the external customers.	Valid. Satisfaction of External Customers represents Customer Focus .
2. Hold a Training Program at the beginning of a production cycle to ensure the implementation of TQM.	Valid. This is part of TQM Culture .
3. Implement Management by Objectives for faster achievement of TQM.	Valid. Commitment to MBO should be from Top Management.
4. Appoint the Head of each department as the person responsible to develop improvement strategies and performance measures.	Invalid . Employee Involvement is required. (Co-operation Principle.)
5. Eliminate wastage of time by avoiding documentation and procedures.	Invalid . Documentation and Procedures are a must. (Control Principle).

Note: For the above answers, 6Cs of TQM, refer **Page 11.4, Q.No.6**

Question 1(d): Assignment – Least Cost Route**(5 Marks)**

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	–

Solution:

Similar to Page No.16.6, Illustration 6, Page No.16.7 Illustration 7.

In case of Prohibited Routes (i.e. assignment not possible), they are assigned a high cost, 'M' where M = Infinity Cost.

I. Given Cost Matrix

M	6	12	4	6
6	M	10	4	6
12	10	M	12	8
4	4	12	M	12
6	6	8	12	M

II. Row Operations

M	2	8	0	2
2	M	6	0	2
4	2	M	4	0
0	0	8	M	8
0	0	2	6	M

III. Column Operations

M	2	6	0	2
2	M	4	0	2
4	2	M	4	0
0	0	6	M	8
0	0	0	6	M

Lines = 4, Order = 5, LOE = 2

IV. Revised Matrix after LOE

M	0	4	0	2
0	M	2	0	2
2	0	M	4	0
0	0	6	M	10
0	0	0	8	M

Lines = 5, Order = 5

V. Optimal Assignment

M	0	4	8	2
0	M	2	0	2
2	0	M	4	0
0	0	6	M	10
0	0	0	8	M

(Based on Arbitrary Assignment)

See **Note** below.

Cities	Cities	Cost
P	→ Q	6
Q	→ S	4
R	→ T	8
S	→ P	4
T	→ R	8
Total Cost (₹ 000)		30

Note: After Step IV, there is a tie in all rows and columns due to multiple zeros, hence, this is a case of Multiple Optimal Solution. Arbitrarily Assigning P to Q, we have Optimal Assignment as per Step V above.

Alternative Solution: (by assigning P to S)

M	0	4	0	2
0	M	2	0	2
2	0	M	4	0
0	0	6	M	10
0	0	0	8	M

Assignment		
Cities	Cities	Cost
P	→ S	4
Q	→ P	6
R	→ T	8
S	→ Q	4
T	→ R	8
Total Cost (₹ 000)		30

Question 2(a): Key Factor – Own Production vs Sub-Contracting (10 Marks)

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

Particulars	A	B	C	D
Selling Price	100	109	121	124
Material Cost	40	42	46	40
Labour Cost:				
Assembly Department at ₹ 10 per hour	15	20	15	20
Machine Department at ₹ 12 per hour	18	24	36	30
Variable Overhead at ₹ 4 per Labour in Assembly Department	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 of A, B, C or D)	Total Fixed Cost (in ₹)
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 inter-changeably 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:

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

- Advise the Management on how many units of each Product are to be manufactured or sub-contracted to fulfill maximum Market Demand. What would be the corresponding Profits?
- What is the minimum number of units to be produced to achieve Break-Even Point?
- 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).

Solution:

Similar to Page No.2.163, Illustration 11.15, N 09 Qn.

1. Contribution Analysis

Particulars	A (₹)	B (₹)	C (₹)	D (₹)
1. Sub-Contractor's Price p.u. (Buying Cost)	85	95	101	100
2. Own Variable Cost of Production (Making Cost)				
(a) Material	40	42	46	40
(b) Labour Cost				
– Assembly Department	15	20	15	20
– Machine Department	18	24	36	30
(c) Variable Overheads	6	8	6	8

Particulars	A (₹)	B (₹)	C (₹)	D (₹)
Sub – Total of Variable Cost	79	94	103	98
3. Savings p.u. if made [1 – 2]	6	1	(2)	2
4. Preference / Decision	Make	Make	Buy	Make
5. Assembly Hours required p.u. (in hours)	$\frac{15}{10} = 1.50$	$\frac{20}{10} = 2.00$	$\frac{15}{10} = 1.50$	$\frac{20}{10} = 2.00$
6. Savings per Hour if made = $\frac{(4)}{(6)}$	4	0.50	NA	1
7. Rank for Production	I	III	NA	II
8. Sale Price per unit	100	109	121	124
9. Contribution on Own Production (9 – 2)	21	15	NA	26
10. Contribution on Sub-Contract (9 – 1)	15	14	20	24
11. Market Demand (units)	40,000	55,000	36,000	30,000

2. Units Allocation with DLH restricted to 2,20,000 hours

Scenario 1 Assuming all 2,20,000 hours of Key Factor is used			Scenario 2 Assuming Output restricted to 1,00,000 units (FC Slab)		
First A:	40,000 units × 1.5 hrs	= 60,000 hrs	First A:	40,000 units × 1.5 hrs	= 60,000 hrs
Next D:	30,000 units × 2 hrs	= 60,000 hrs	Next D:	30,000 units × 2 hrs	= 60,000 hrs
Balance for B:	<u>50,000 units</u> × 2 hrs	= <u>1,00,000 hrs</u>	Balance for B:	<u>30,000 units</u> × 2 hrs	= <u>60,000 hrs</u>
Note: Total Production in above = 1,20,000 units, relating to 2 nd Slab of Fixed Cost = ₹ 12,50,000.			Note: Total Production in above = 1,00,000 units, relating to 1 st Slab of Fixed Cost = ₹ 8,43,000.		
Profit Statement			Profit Statement		
Contribution on Production:			Contribution on Production:		
A	40,000 × ₹ 21	= 8,40,000	A	40,000 × ₹ 21	= 8,40,000
B	50,000 × ₹ 15	= 7,50,000	B	30,000 × ₹ 15	= 4,50,000
C	30,000 × ₹ 26	= 7,80,000	C	30,000 × ₹ 26	= 7,80,000
Sub – Total		23,70,000	Sub – Total		20,70,000
Contribution on Sub-Contract			Contribution on Sub-Contract		
B	5,000 × ₹ 14	= 70,000	B	25,000 × ₹ 14	= 3,50,000
C	36,000 × ₹ 20	= 7,20,000	C	36,000 × ₹ 20	= 7,20,000
Sub – Total		7,90,000	Sub – Total		10,70,000
Total Contribution		31,60,000	Total Contribution		31,40,000
Less: Fixed Cost		12,50,000	Less: Fixed Cost		8,43,000
Profit		19,10,000	Profit		22,97,000

Conclusion: From the above, Scenario 2 is preferable due to higher profits.

3. Computation of Break-Even Point

(a) If Fixed Cost is	₹ 8,43,000	₹ 12,50,000	₹ 16,00,000
(b) Contribution earned from Product A (I Rank) = 40,000 units × ₹ 21 p.u.	₹ 8,40,000	₹ 8,40,000	₹ 8,40,000
(c) Hence, Balance Contribution required to achieve BEP (a – b)	₹ 3,000	₹ 4,10,000	₹ 7,60,000
(d) So, Required Quantity of D (II Rank) to recover the above Fixed Cost = (c) ÷ ₹ 26	116 units	15,770 units	29,231 units
(e) Total Break-even Quantity = A: 40,000 + D (as per above)	40,116 units	55,770 units	69,231 units

4. Best Strategy if Assembly Labour is not a Limiting Factor and no compulsion to fulfill Market Demand

Note: Assuming Sub-Contracting Prices remain as given, and hence it is beneficial to buy "C" than make.

If Assembly Labour is not a Key Factor, decisions are based on **Contribution p.u.** as per Point 10 and 11 of **WN 1** above. Hence, the two possible scenarios are evaluated as under –

Scenario I: Fixed Cost = ₹ 8,43,000 (i.e. output restricted to 1,00,000 units)			Scenario I: Fixed Cost = ₹ 12,50,000 (i.e. output subject to maximum demand)		
Contrib from D	$30,000 \times ₹ 26 =$	7,80,000	Contrib from D	$30,000 \times ₹ 26 =$	7,80,000
A	$40,000 \times ₹ 21 =$	8,40,000	A	$40,000 \times ₹ 21 =$	8,40,000
B (Note 1)	$30,000 \times ₹ 15 =$	4,50,000	B (Note 2)	$55,000 \times ₹ 15 =$	8,25,000
C (sub-cont)	$36,000 \times ₹ 20 =$	7,20,000	C (sub-cont)	$36,000 \times ₹ 20 =$	7,20,000
Sub –Total		27,90,000	Sub –Total		31,65,000
Less: Fixed Cost		8,43,000	Less: Fixed Cost		12,50,000
Profit		19,47,000	Profit		19,15,000

Note 1: Output of B will be restricted to 30,000 units, being the limit of 1,00,000 units, after production of D 30,000 units and A 40,000 units.

Note 2: Since the Company operates in the Second Slab of Fixed Costs, it will achieve full output of B.

Note 3: In both cases, it is beneficial to buy C than make. Hence, C will be bought-in.

Best Strategy: Scenario I will be preferred in this case due to higher profits.

Question 2(b): Simulation – Servicing

(6 Marks)

A Computer Service Centre services Laptops. It is proposed to study the arrival and servicing pattern of the Service Centre. The following 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

Solution:

Similar to Page No.21.17, Illustration 17. N 08 Qn.

Random Number Allocation Table for Arrivals

No. of Computers	Arrival Frequency	Probability	Cumulative Probability	Random No.
8	10	0.10	0.10	0 – 9
9	25	0.25	0.35	10 – 34
10	20	0.20	0.55	35 – 54
11	15	0.15	0.70	55 – 69
12	18	0.18	0.88	70 – 87
13	12	0.12	1.00	88 – 99
	100	1.00		

Random Number Allocation Table for Service

No. of Computers	Service Frequency	Probability	Cumulative Probability	Random No.
8	15	0.15	0.15	0 – 14
9	20	0.20	0.35	15 – 34
10	25	0.25	0.60	34 – 59
11	16	0.16	0.76	60 – 75
12	17	0.14	0.90	76 – 89
13	10	0.10	1.00	90 – 99
	100	1.00		

Simulation Table

Day	Random Nos. Arrivals	No. of Computer Arrivals	Random Nos. Service	No. of Computer Serviced	Closing / Waiting Laptops
1	69	11	52	10	1 + 11 - 10 = 2
2	45	10	36	10	2 + 10 - 10 = 2
3	46	10	62	11	2 + 10 - 11 = 1
4	10	9	49	10	1 + 9 - 10 = 0
5	82	12	68	11	0 + 12 - 11 = 1
6	16	9	77	12	(See Note) 1 + 9 - 12 = 0
7	35	10	55	10	0 + 10 - 10 = 0
8	70	12	66	11	0 + 12 - 11 = 1
9	57	11	51	10	1 + 11 - 10 = 2
10	92	13	88	12	2 + 13 - 12 = 3
Total		107		107	12

Note: On Day 6, Total available / arrival for Service is 10, hence service is also limited to 10 units.

Average Number of Laptops held for more than one day = $\frac{12}{10} = 1.20$

Question 3(a): Standard Costing – Reconciliation – Two Years Summary P&L and Percentage Analysis (10 Marks)

RST Ltd has provided the following summarized results for two years:

Particulars for the year ended (₹ in Lakhs)	31-03-2013	31-03-2014
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 31-03-2014, Sale Price has increased by 15% whereas Material and Overheads 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 2012-2013 showing the factors responsible for the change in Profit in 2013-2014.

Solution:

Similar to Page No.1.55, Q.No.32 M 97, M 99, M 00, N 07 Qn.

Note: Financial Information in ₹ Lakhs

- Year 2012-2013 = Base Year or Budget Year. 2013-2014 = Actuals. First Sales Variances are analysed, and increase / decrease in output is identified.
- Sales Volume Variance (as per WN 1 below) is **150 A**. So, there is a decrease in output from 2012-2013 to 2013-2014.
Percentage Decrease in Output = $\frac{150 \text{ Lakhs Adv}}{3,000 \text{ Lakhs}} = 5\%$. So, 2013-2014 Output = 5% below 2012-2013 Output.
- Std Costs of 2013-14** = Expected Cost for Actual Output of 2013-14 = 2012-13 (Budget Costs) (less) 5% thereon.

1. Sales Variances

(1):BQ×BP	Col.(2):AQ×BP	(3):AQ×AP
(given) = 3,000	$\frac{3,277.50}{115\%} = 2,850$	(given) = 3,277.50
Sales Volume Variance + Sales Price Variance = 3000 - 2850 = 150 A = 2850 - 3277.5 = 427.5 F		
Total Sales Variance = 3,000 - 3,277.50 = 277.50 F		

Note: PVR = $\frac{\text{Fixed Cost} + \text{Profit}}{\text{Sales}} = \frac{300 + 200}{3,000} = 16.67\%$.

2. Materials Variances

Col.(1): SQ×SP	Col.(2):AQ×SP	Col.(3):AQ×AP
2000 (-) 5% = 1,900	$\frac{2,357.50}{115\%} = 2,050$	(given) = 2,357.50
Usage Variance + Price Variance = 1900 - 2050 = 150 A = 2050 - 2357.5 = 307.5 A		
Total Material Cost Variance = 1,900 - 2,357.50 = 457.50 A		

NP Ratio = $\frac{\text{Profit}}{\text{Sales}} = \frac{200}{3,000} = 6.67\%$

- Under Marginal Costing Approach, Effect on Profit due to Sales Volume = Contribution foregone = SVV × Budgeted PVR = 150 A × 16.67% = 25.00 Adv.
- Under Absorption Costing Approach, Effect on Profit due to Sales Volume = Net Profit foregone = SVV × Budgeted NP Ratio = 150 A × 6.67% = 10.00 A.

3. VOH Variances

Col. (1): SH × SR	Col. (2): AH × SR	Col. (3): AH × AR
500 (–) 5% = 475.00	$\frac{525}{105\%} = 500$	(Given) 525.00
Efficiency Variance = 475 – 500 = 25.00 A + Rate / Exp. Variance = 500 – 525 = 25.00 A		
Total VOH Cost Variance = 475.00 – 525.00 = 50.00 A		

4. FOH Variances

Col. (1): AO × SR	Col. (2): AH × SR	Col. (3): BFOH	Col. (4): AFOH
300 (–) 5% = 285.00	$\frac{367.50}{105\%} = 350.00$	(Given) 300.00	(Given) 367.50
FOH Efficiency Variance = 285.00 – 350.00 = 65.00 A + FOH Capacity Variance = 350 – 300 = 50.00 F + FOH Expenditure Variance = 300 – 367.50 = 67.50 A			
FOH Volume Variance = 285 – 300 = 15.00 A + FOH Expenditure Variance b/fd as above = 67.50 A			
Total FOH Cost Variance = 285.00 – 367.50 = 82.50 A			

5. Operating Statement/Reconciliation Statement (in ₹ Lakhs) (any one Approach may be adopted in exams)

Note: Favourable Variances are indicated as such, and Adverse Variances are indicated within brackets (–) here.

Particulars	Method 1	Method 2
	Marginal Costing Approach	Absorption Costing Approach
Budgeted Profit (2012–13 Profit)	200.00	200.00
Effect of Sales Variances		
+ / – Sales Volume Variance Effect on Profit	150 A × PVR 16.67% = (25.00)	150 A × NP Ratio 6.67% = (10.00)
Sales Price Variance	427.50	427.50
Effect of Cost Variances		
+ / – Material Variances Usage	(150.00)	(150.00)
Price	(307.50)	(307.50)
VOH: Efficiency	(25.00)	(25.00)
Rate	(25.00)	(25.00)
FOH Variances Efficiency	Not Applicable	(65.00)
Capacity	Not Applicable	50.00
Expenditure	(67.50)	(67.50)
Actual Profit (in 2013–2014)	27.50	27.50

Question 3(b): Linear Programming – Simplex Method

(6 Marks)

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 (₹/ units)
	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.

- Determine the Optimal Product Mix using simplex method and find the Optimal Profit.
- Comment on the Solution, Objective Function and the Constraints.

Solution:

Similar to Page No.18.9, Illustration 4, M 05, M 11, M 13 Qn.

Basic Data: X_1 X_2 X_3 Contrib. p.u. ₹ 8 ₹ 6 ₹ 5 Hours conditions: Available Machining hrs 4 4 6 384 hrs Assembly hrs 3 2 4 288 hrs	The LPP is as under – Maximise $Z = 8x_1 + 6x_2 + 5x_3$ Subject to: $4x_1 + 4x_2 + 6x_3 \leq 384$ $3x_1 + 2x_2 + 4x_3 \leq 288$ $x_3 = 30$ $x_1, x_2, x_3 \geq 0$	Introducing Slack Variables, we have Maximise $Z = 8x_1 + 6x_2 + 5x_3 + 0S_1 + 0S_2 - MA$ Subject to: $4x_1 + 4x_2 + 6x_3 + S_1 = 384$ $3x_1 + 2x_2 + 4x_3 + S_2 = 288$ $x_3 + A = 30$ $x_1, x_2, x_3, S_1, S_2, A \geq 0$
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S_1, S_2 are the slacks for the 2 $\leq$ Constraints above. A is the Artificial Variable for the Equality Constraint.

First Simplex Table:

Fixed Ratio	Program	Profit	Quantity	x_1	x_2	x_3	S_1	S_2	A	Repl. Ratio
6	S_1	0	384	4	4	6	1	0	0	$384 \div 6 = 64$
4	S_2	0	288	3	2	4	0	1	0	$288 \div 4 = 72$
NA	A	-M	30	0	0	1	0	0	1	$30 \div 1 = 30$
Decision:		Z (Objective Value)		8	6	5	0	0		Min non-ve
In = Key Column = x_3		C (Computed Value)		0	0	-M	0	0		
Out = Key Row = A		NER		8	6	5+M	0	0		

Note: In the above Table, Key Row is shown by dotted encircling line, and Key Column is shown by shaded column. Artificial Variable, identified as Key Row (i.e. Outgoing Variable) is **eliminated** in further iterations.

Note: For Non-Key Rows, $A = (\text{Previous Table Corresponding Row Element}) - B = (\text{Key Row Element} \times \text{Fixed Ratio})$

Computation for S_1 Row							Computation for S_2 Row						
A	384	4	4	6	1	0	A	288	3	2	4	0	1
-B	180	0	0	6	0	0	-B	120	0	0	4	0	0
A-B	204	4	4	0	1	0	A-B	168	3	2	0	0	1

The above A-B values are carried over to the Third Simplex Table in S_1 and S_2 Rows (being Non-Key Rows of 1st Table).

Second Simplex Table:

Fixed Ratio	Program	Profit	Quantity	x_1	x_2	x_3	S_1	S_2	Repl. Ratio
NA	S_1	0	204	4	4	0	1	0	$204 \div 4 = 51$ Min non-ve
3/4	S_2	0	168	3	2	0	0	1	$168 \div 3 = 56$
0	x_3	5	30	0	0	1	0	0	$30 \div 0 = \infty$
Decision:		Z (Objective Value)		8	6	5	0	0	
In = Key Column = x_1		C (Computed Value)		0	0	5	0	0	
Out = Key Row = S_1		NER		8	6	0	0	0	

Note: In the above Table, Key Row is shown by dotted encircling line, and Key Column is shown by shaded column.

Note: For Non-Key Rows, $A = (\text{Previous Table Corresponding Row Element}) - B = (\text{Key Row Element} \times \text{Fixed Ratio})$

Computation for S_2 Row							Computation for x_3 Row						
A	168	3	2	0	0	1	A	30	0	0	1	0	0
-B	153	3	3	0	3/4	0	-B	0	0	0	0	0	0
A-B	15	0	-1	0	-3/4	1	A-B	30	0	0	1	0	0

The above A-B values are carried over to the Third Simplex Table in S_2 and x_3 Rows (being Non-Key Rows of 2nd Table).

Third Simplex Table:

Fixed Ratio	Program	Profit	Quantity	x_1	x_2	x_3	S_1	S_2	Repl. Ratio
	x_1	8	51	1	1	0	$\frac{1}{4}$	0	
	S_2	0	15	0	-1	0	$-\frac{3}{4}$	1	
	x_3	5	30	0	0	1	0	0	
Decision: Since all $NER \leq 0$ for max. objective, the Third Table is optimal .		Z (Objective Value)		8	6	5	0	0	
		C (Computed Value)		8	8	5	2	0	
		Net Evaluation Row		0	-2	0	-2	0	

Answer: $x_1 = 8$ units, $x_2 = 0$, $x_3 = 5$ units.

$$\text{Maximum Contribution} = 8(51) + 6(0) + 5(30) = 408 + 0 + 150 = \text{₹ } 558.$$

Comments:

- This is a 3 Variable, 3 Constraint LPP, with an **Optimal and Unique Solution** as per Third Simplex Table given above.
- As per this solution, Slack S_1 having $NER = -2$ in Optimal Table indicates that Machining Department is used fully. There is an Opportunity Cost of ₹ 2 per hour in this Department.
- As per this solution, Slack S_2 having $NER = 0$ in Optimal Table indicates that Assembly Department has a spare capacity of 15 hours (from Quantity Column of S_2).

Question 4(a): Activity Based Costing – Profit Statement**(8 Marks)**

PQR Ltd specializes in the distribution of Pharmaceutical Products. It buys from Pharmaceutical Companies and re-sells to each of the three different Markets:

- General Supermarket Chains
- Drug Store Chains
- 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:

Particulars	General Supermarket Chains	Drug Store Chains	Chemist Shops
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 Delivery	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 for 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 Despatched to Customer Stores	Number of Cartons despatched 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.

Solution:

Similar to Page No.8.27, Illustration 11, N 10, M 03 (PE 2) Similar Qn.

Particulars	General Super-market Chains	Drug Store Chains	Chemist Shops	Total
1. Number of Orders	1,000	2,650	9,500	13,150
2. Number of Deliveries	960	2,470	8,570	12,000
3. No. of Cartons × No. of Deliveries	250 × 960 = 2,40,000	75 × 2470 = 1,85,250	12 × 8,570 = 1,02,840	5,28,090

Particulars	General Super-market Chains	Drug Store Chains	Chemist Shops	Total
4. No. of Hours × No. of Deliveries	$2 \times 960 = 1,920$	$0.5 \times 2470 = 1,235$	$0.1 \times 8570 = 857$	4,012
5. Average Sale Price per Delivery	96,500	32,450	6,225	
6. Average COGS per Delivery	94,650	31,800	5,950	
7. Total Sales Value (2 × 5)	9,26,40,000	8,01,51,500	5,33,48,250	22,61,39,750
8. Total Cost of Goods Sold (2 × 6)	9,08,64,000	7,85,46,000	5,09,91,500	22,04,01,500
9. Gross Profit (7 – 8)	17,76,000	16,05,500	23,56,750	57,38,250
10. Operating Costs (apportioned on ABC)				
(a) Order Processing: $\frac{₹ 5,91,750}{13,150 \text{ orders}} = ₹ 45 \times (1)$	45,000	1,19,250	4,27,500	5,91,750
(b) Store Delivery: $\frac{₹ 9,60,000}{12,000 \text{ delays}} = ₹ 80 \times (2)$	76,800	1,97,600	6,85,600	9,60,000
(c) Despatch to Stores: $\frac{₹ 7,92,135}{5,28,090 \text{ cartons}} = ₹ 1.5 \times (3)$	3,60,000	2,77,875	1,54,260	7,92,135
(d) Shelf Stocking: $\frac{₹ 80,240}{4,012 \text{ hours}} = ₹ 20 \times (4)$	38,400	24,700	17,140	80,240
Total Operating Costs	5,20,200	6,19,425	12,84,500	24,24,125
11. Operating Income (9 – 10)	12,55,800	9,86,075	10,72,250	33,14,125

Question 4(b): Network Analysis – Project Crashing

(8 Marks)

The following table relates to a Network:

Activity	Normal Time (days)	Crash Time (days)	Normal Cost (₹)	Crash Cost (₹)
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

Solution:

Similar to Page No.19.30, Illustration 20, M 04 Qn.

1. Slope Table

Activity (1)	Normal Days (2)	Crash Days (3)	Maximum Time Reduction Possible (4) = (2–3)	Normal Cost (5)	Crash Cost (6)	Cost Difference (7) = (6–5)	Slope = Crash Cost ₹ per Day (8) = (7) ÷ (4)
1 – 2	5	4	1	30,000	40,000	10,000	10,000
2 – 3	6	4	2	48,000	70,000	22,000	11,000
2 – 4	8	7	1	1,25,000	1,50,000	25,000	25,000
2 – 5	9	6	3	75,000	1,20,000	45,000	15,000
3 – 4	5	4	1	82,000	1,00,000	18,000	18,000
4 – 5	7	5	2	50,000	84,000	34,000	17,000

2. Paths Table

Path	Normal Duration (days)	Min.Duration (Crash Days)	Duration after Stage				
			I	II	III	IV	
X: 1-2-3-4-5	5+6+5+7 = 23 (Initial CP)	4+4+4+5 = 17 (min)	22	20	18	17	
Y: 1-2-4-5	5+8+7 = 20	4+7+5 = 16	19	19	17	17	
Z: 1-2-5	5 + 9 = 14	4+6 = 10	13	13	13	13	

Note:

- Normal Duration is 23 days (Initial Critical Path).
- Since Minimum Duration is only 17 days on Path X, the Project can be crashed and brought to min. 17 days only.
- Numbers in the Columns "Duration after Stage" are updated at every stage of crashing.

4. Crashing Process

Stage	Decision on Crashing	Crash Costs	Cumulative Crash Costs
I	Initial CP is Path X, Activities available for crashing are 1-2, 2-3, 3-4 & 4-5. Activity with least slope therein is 1-2. This can be crashed for 1 day maximum. So, Activity 1-2 is crashed for its maximum period of 1 day.	₹ 10,000 × 1 day = ₹ 10,000	₹ 10,000
II	Path X is still CP. Activities available for crashing are 2-3, 3-4 & 4-5, with slopes ₹ 11,000, ₹ 18,000 and ₹ 17,000 respectively. Considering Least Slope and Maximum Crashing Possible, Activity 2-3 is crashed for 2 days. This is considered in 2 stages as II(a) and II(b) for 1 day each.	₹ 11,000 × 1 day = ₹ 11,000	₹ 21,000
		₹ 11,000 × 1 day = ₹ 11,000	₹ 32,000
III	Path X is still CP. Activities available for crashing are 3-4 and 4-5, with slopes ₹ 18,000 and ₹ 17,000 respectively. Considering Least Slope and Maximum Crashing Possible, Activity 4-5 is crashed for 2 days. This is considered in 2 stages as III(a) and III(b) for 1 day each.	₹ 17,000 × 1 day = ₹ 17,000	₹ 49,000
		₹ 17,000 × 1 day = ₹ 17,000	₹ 66,000
IV	Path X is still CP. Activities available for crashing are 3-4, with slope ₹ 18,000. Hence, this Activity is crashed for 1 day (maximum time reduction possible).	₹ 18,000 × 1 day = ₹ 18,000	₹ 84,000

After this, no further Crashing is possible since Minimum Duration of the Project is 17 days as per Note in WN 2 above.

5. Costs Table (Amounts in ₹)

Stage		Days	Normal Cost	OH Cost	Cumulative Crash Costs	Penalty	Total Costs	Remarks
Initial /Normal		23	4,10,000	$23 \times 5,000 = 1,15,000$	Nil	$3 \times 15,000 = 45,000$	5,70,000	Cost of Normal Duration
I		22	4,10,000	$22 \times 5,000 = 1,10,000$	10,000	$2 \times 15,000 = 30,000$	5,60,000	
II	a	21	4,10,000	$21 \times 5,000 = 1,05,000$	21,000	$2 \times 15,000 = 15,000$	5,51,000	
	b	20	4,10,000	$20 \times 5,000 = 1,00,000$	32,000	Nil	5,42,000	Lowest Cost and Optimal Duration
III	a	19	4,10,000	$19 \times 5,000 = 95,000$	49,000	–	5,54,000	
	b	18	4,10,000	$18 \times 5,000 = 90,000$	66,000	–	5,66,000	
IV		17	4,10,000	$17 \times 5,000 = 85,000$	84,000	–	5,79,000	Cost of Minimum Duration

Question 5(a): Transfer Pricing – Pricing at Opportunity Cost

(8 Marks)

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 Cost 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 follows:

Selling Price per unit	₹ 1,200
Variable Cost per unit:	
(i) Two Components from X	2 at Transfer Price
(ii) Other Variable Costs per unit	₹ 375
Fixed Cost 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).

Solution:

Similar to Principles illustrated in Page 5.12 to 5.16, Illustration 4 to 6.

1. Computation of Weighted Average Transfer Price

Particulars	Situation A	Situation B	Situation C
1. Total Capacity	35,000	35,000	35,000
2. External Demand (given)	15,000	19,000	35,000
3. Demand from Division Y	20,000	20,000	20,000
4. Total Requirement (2 + 3)	35,000	39,000	55,000
5. Shortfall in meeting external demand [4 – 1]	Nil	4,000	20,000
6. Opportunity Cost = Contribution Lost (₹ 300 – ₹ 157)	–	4,000 × ₹ 143 = ₹ 5,72,000	20,000 × ₹ 143 = ₹ 28,60,000
7. Average Opportunity Cost pu of Internal Transfer (6 ÷ 3)	₹ Nil	₹ 28.60	₹ 143
8. Average Transfer Price pu of Internal Transfer = Variable Cost ₹ 157 p.u. + Opportunity Cost (from 7)	157 + Nil = ₹ 157.00	157 + 28.60 = ₹ 185.60	157 + 143 = ₹ 300.00

Note: Alternative for Weighted Average Transfer Price is as under –

1. Total Opportunity Cost (as above)	–	₹ 5,72,000	₹ 28,60,000
2. Variable Cost of Production at ₹ 157 p.u.	35,000 × ₹ 157 = ₹ 54,95,000	35,000 × ₹ 157 = ₹ 54,95,000	35,000 × ₹ 157 = ₹ 54,95,000
3. Total Cost of Capacity [1 + 2]	₹ 54,95,000	₹ 60,67,000	₹ 83,55,000
4. Weighted Average Price [(3) ÷ 35,000 units]	₹ 157.00	₹ 173.33	₹ 238.71

Note: This alternative is based on the assumption that External Sales and Internal Transfers will be priced at the same level.

2. Profit Statement for Division X (based on above TP) (amounts in ₹)

Particulars	Situation A	Situation B	Situation C
Contribution from Outside Sales at ₹ 143 pu	15,000 × ₹ 143 = ₹ 21,45,000	15,000 × ₹ 143 = ₹ 21,45,000	15,000 × ₹ 143 = ₹ 21,45,000
Contribution from Internal Transfer	20,000 × ₹ Nil = ₹ Nil	20,000 × ₹ 28.60 = ₹ 5,72,000	20,000 × ₹ 143 = ₹ 28,60,000
Total Contribution	₹ 21,45,000	₹ 27,17,000	₹ 50,05,000
Less: Fixed Cost (given)	(20,62,000)	(20,62,000)	(20,62,000)
Profit	₹ 83,000	₹ 6,55,000	₹ 29,43,000

Note: In all cases, Internal Transfer will be 20,000 units since Internal Transfer will be met first as per Company policy. Contribution from External Sales will be equal to the Opportunity Cost included in the Transfer Price as per **WN 1**. External Sales will be 15,000 units in all cases, since Internal Demand is satisfied first.

3. Profit Statement for Division Y (based on above TP) (amounts in ₹)

Particulars	Situation A	Situation B	Situation C
1. Units	10,000 units	10,000 units	10,000 units
2. Selling Price per unit	1,200	1,200	1,200
3. Own Variable Cost pu of Division Y	375	375	375
4. Transfer In Cost = 2 units × TP as above	2 × 157 = 314	2 × 185.60 = 371.20	2 × 300 = 600
5. Contribution per unit = 2 – 3 – 4	511	453.80	225
6. Total Contribution (1 × 5)	51,10,000	45,38,000	22,50,000
7. Fixed Cost (given)	(13,50,000)	(13,50,000)	(13,50,000)
8. Profit (6 – 7)	37,60,000	31,88,000	9,00,000

Question 5(b): Relevant Cost Analysis**(8 Marks)**

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 Materials 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	Historical / Sunk (already incurred)	IR
2 (i)	Material Z: 550 kg × ₹ 580 / kg	Historical (already purchased)	IR
(ii)	Material Z: 550 kg × ₹ 650 per kg	Out-of-Pocket / Incremental	R
3 (i)	Engineer's Salary ₹ 47,500	Specific / Discretionary / Avoidable	R
(ii)	Engineer's Free Time Cost 60/150 × 47,500	Committed (anyhow to be incurred)	IR
4 (i)	Design Cost ₹ 30,000	Historical / Sunk (already incurred)	IR
(ii)	Design Cost ₹ 50,000	Opportunity Cost (Loss of Revenue)	R

Note: For the above answers, Refer Principles in **Chapter 4, Page 4.1 to Page 4.7**

Question 6(a): Budgeting – Sales, Production, Material Purchase (7 Marks)

DEF Ltd manufactures and sells a single product and has estimated Sales Revenue of ₹ 397.80 Lakhs 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
	Material 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:

- Number of units of Product proposed to be sold and Selling Price per unit.
- Production Budget in units.
- Material Purchase Budget in units.

Solution:

Refer Page 7.19, Q.No.10, Similar Qn., M 85 (Inter) Similar Qn.

1. Computation of Budgeted Sales Quantity

Particulars	Computation	Result
Material Cost	A: 6 Kg × ₹ 16 = ₹ 96 B: 3 Kg × ₹ 10 = ₹ 30	₹ 126
Labour Cost	Machine Shop 4 hrs × ₹ 14 = ₹ 56 Assembly Shop 2 hrs × ₹ 7 = ₹ 14	₹ 70
Production Overheads	20% of Direct Labour Cost of ₹ 70	₹ 14
Variable SOH	Given	₹ 6
Cost per unit excluding Fixed SOH		₹ 216

Let Sale Quantity = "Q" units.

So, Sales Value = Cost + Profit = ₹ 397.80 Lakhs (given)

We have, Cost (excluding Fixed SOH) + Fixed SOH + Profit = Sales Value

So, (216 × Q) + 7,20,000 + 20% of 3,97,80,000 = 3,97,80,000

On solving, 216Q = 3,11,04,000. So, Q = $\frac{3,11,04,000}{216} = \mathbf{1,44,000 \text{ units}}$ (i.e. units proposed to be sold)

So, Budgeted Sale Price per unit = $\frac{₹ 3,97,80,000}{1,44,000 \text{ units}} = \mathbf{₹ 276.25}$

2. Computation of Production Quantity:

Budgeted Production = Sales + Closing Stock of FG – Opening Stock of FG = 1,44,000 + 30,000 – 25,000 = **1,49,000 units.**

Note: The above equation for Budgeted Production may also be shown in Statement Form, as under –

Particulars	Units
Budgeted Sales	1,44,000
Add: Closing Stock of Finished Goods	30,000
Sub-Total	1,74,000
Less: Opening Stock of Finished Goods	25,000
Budgeted Production Quantity	1,49,000

3. Materials Consumption and Purchase Budget (in kgs)

Particulars	Material A	Material B
Budgeted Material Usage	1,49,000 × 6 kg = 8,94,000 Kg	1,49,000 × 3 kg = 4,47,000 kg
Add: Closing Stock	80,000 Kg	55,000 kg
Sub-Total	9,74,000 kg	5,02,000 kg
Less: Opening Stock	75,000 kg	40,000 kg
Budgeted Purchase Quantity	8,99,000 kg	4,62,000 kg

Note: Since the requirement is to prepare Material Purchase Budget in Units, Cost details are not shown above.

Question 6(b): Performance Measurement – Analysis of Variances**(5 Marks)**

Y Ltd is a manufacturer of Cardboard Boxes. An analysis of its operating Income between 2012 and 2013 shows the following:

Particulars	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
Costs (₹)	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.

Solution:**Refer Page 14.19, Illustration 1, Part Qn. RTP, N 05 (Adapted)****A. Industry Market Size Factor**

Additional Sales Quantity 4,20,000 – 4,00,000 = 20,000 units ↓ Market Size Effect = 3% of 4,00,000 = 12,000 units Market Share Effect = (balancing figure) = 8,000 units.	(a) Net Effect of Growth Component (given) = ₹ 1,40,000 F (b) Increase in Operating Income due to Market Size Factor rather than any specific strategic action = $= ₹ 14,00,000 \times \frac{12,000}{20,000} = ₹ \mathbf{84,000 F}$ (c) Balance attributed to Product Differentiation (a–b) = ₹ 56,000 F
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B. Product Differentiation Factor

Particulars	₹
(a) Increase in Selling Price of Products = Revenue Effect of Price Recovery Component (given)	4,20,000 F
(b) Increase in Prices of Inputs = Cost Effect of Price Recovery Component (given)	2,56,000 A
(c) Growth in Market Share due to Product Differentiation, i.e. for 8,000 units (as per Item c above)	56,000 F
Increase in Operating Income due to Product Differentiation Factor	2,20,000 F

C. Cost Leadership Factor = Cost Effect of Productivity Component = ₹ **58,000 F** (given).

D. Summary of Effect of Industry Market Size, Product Differentiation & Cost Leadership Factors

Particulars	₹
Operating Income of 2012	10,80,000
Add: (a) Industry Market Size Factor	84,000 F
(b) Product Differentiation Factor	2,20,000 F
(c) Cost Leadership Factor / Productivity Component	58,000 F
Operating Income of 2013	14,42,000

Question 6(c): Assignment and Transportation (4 Marks)

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

Solution:**Refer Principles in Chapter 16 and Chapter 17**

A: Possible, e.g. when 5 jobs are to be assigned to 3 workers, by introducing 2 dummy rows / columns, only 3 jobs get assigned to workers, and the balance 2 jobs will remain undone with the existing resources.

B: Not Possible, since 1 Dummy Row or Column is sufficient to balance the Matrix in terms of Quantity generally. However, in case of multiple constraints with respect to spare capacity, sometimes more than one Dummy Row or Column may be required to complete the matrix.

C: Not Possible, since 1 Dummy Row or Column is sufficient to balance the Matrix.

D: Not Possible, since 1 Dummy Row or Column is sufficient to balance the Matrix.

Question 7(a): Pricing Decisions and Pareto Analysis**(4 Marks)**

How is Pareto Analysis helpful in pricing of products in the case of a Firm dealing with multiple products?

Solution:**Refer Page 3.13, Q.No.36, Point 1.****Question 7(b): ABC – Customer Profitability****(4 Marks)**

Discuss the benefits of Customer Profitability Analysis.

Solution:**Refer Page 8.12, Q.No.26.****Question 7(c): Theory of Constraints – Classification****(4 Marks)**

Classify the following items appropriately under the three measures used in the Theory of Constraints:

S.No	Items	Answer
(i)	Research and Development Cost	Investments and Inventory
(ii)	Rent / Utilities	Other Operating Costs
(iii)	Finished Goods Inventory	Investments and Inventory
(iv)	Depreciation	Other Operating Costs
(v)	Labour Cost	Other Operating Costs
(vi)	Stock of Raw Materials	Investments and Inventory
(vii)	Sales	Throughput Contribution
(viii)	Cost of Equipment and Buildings	Investments and Inventory

Note: For Concept Discussion, Refer **Page 12.1 Q.No.4, very similar Question.**

Question 7(d): Transportation**(4 Marks)**

Will the solution for a Minimization Problem obtained by Vogel's Approximation Method and Least Cost Method be the same? Why?

Solution:**Refer Page 17.2, Q.No.6, M 11 Qn.**

Question 7(e): Transportation

(4 Marks)

In a 3×4 Transportation problem for minimizing Costs, will the $R_2 C_1$ cell (at the intersection of the 2nd Row and 1st Column) always figure in the Initial Solution by the North West Corner Rule? Why?

Solution:

Refer Principles in Page No.17.1 Q.No.3

- The first allocation in IBFS by North West Corner Rule will be in $R_1 C_1$ Cell.
- If the R_1 Quantity is higher than C_1 Quantity, then C_1 Quantity will be allocated to $R_1 C_1$ Cell, and C_1 Column will be cancelled, on account of satisfaction of C_1 Quantity Condition.
- Hence, in such case, no further allocation will fall in any of the further rows of C_1 Column. Hence, $R_2 C_1$ Cell Allocation will **not always figure** in the Initial Solution by North West Corner Method.