FINAL – MAY 2018

PAPER 5: ADVANCED MANAGEMENT ACCOUTING

Test Code: FTP 5
Branch (MULTIPLE) Date :

(100 Marks)

Note: ***Question No.1 is compulsory. Candidates are required to answer any five questions from the remaining six questions.***

Wherever necessary, suitable assumptions may be made and disclosed by way of a note.

Working notes should form part of the answers.
No statistical or other table will be provided with this question paper.

Question 1

a.

While preparing to enter the market with a new product, X Ltd. has to adopt a skimming or penetration pricing strategy.

Skimming Pricing*:* It is a policy of high prices during the early period of a product's existence. This can be synchronised with high promotional expenditure and in the later years the prices can be gradually reduced.

Penetration Pricing: Penetrating pricing, means a pricing suitable for penetrating mass market as quickly as possible through lower price offers. The company may not earn profit by resorting to this policy during the initial stage. Later on, the price may be increased as and when the demand picks up. **(2 marks)**

X Ltd. should follow '**Penetration Pricing'** as - **(3 marks)**

(a) Demand of product 'Gamma' can be increase by lowering the price as it has elastic demand.

(b) There is also scope of substantial savings on large scale production and increase in demand is sustained by the adoption of low pricing policy.

(c) The prices fixed at a low level act as an entry barrier to the prospective competitors.

b.

Non- Financial Perspective	Objective	Performance Measure
Customer Perspective **(1/2 mark)**	Increase the customer loyalty. *Or* Retaining the existing customers.	Percentage of customers using loyalty cards. *Or* No. of discount vouchers redeemed.
Internal Business Perspectives **(2 mark)**	For customers to pay for goods in a reasonable time.	Time spent by customers in queuing to pay for products at a check out.
	Or Paying proper attention to the customers and their product enquiries. *Or* Provide necessary support to the existing loyal customers.	*Or* Time spent by customers care executives in handling customers queries. *Or* No. of times home delivery made.
Learning & Growth Perspectives**(1/2 mark)**	To have qualified staffs able to meet the needs of the customer. *Or* Adding new products for new segments.	No. of staff training days. *Or* No. of schemes launched.

c. R1C1 appears at the intersection of R1 and C1. Hence, it will have its zero replaced by minimum of a, b, c, or d in the next operation since the number of lines to cover zeros is less than 3. **(1 1/2 marks)**

In the next step, a or b or c or d will have one zero. Then, number of lines will be 3, the order of the matrix. Assignments will be made to the Zeros. Hence, R1C1 cannot figure in this. **(1 1/2 marks)**

Interpretation

An assignment of R1C1 will eliminate the use of other costs available on R1 and C1 entirely. The left over will be a, b, c, or d combinations which are more than zero. Hence, R1C1 taking on assignment will be non-optimal. **(2 marks)**

d.

Relevant / Not Relevant (1 mark each)

S. No.	Name of the Cost	Example	Relevant / Not Relevant
(i)	Sunk Cost	Written down value of	Not Relevant in

		machine already purchased.	decision making.
(ii)	Opportunity Cost	Funds invested in business or deposited into bank.	Useful in decision making.
(iii)	Out of Pocket Cost	Commission to salesman on sales, Carriage inward.	Relevant for decision making.
(iv)	Differential Cost	Include all fixed and variable cost which are increased /decreased.	Relevant in specific decision making.
(v)	Notional Cost	Notional Rent for use of space.	Relevant, if company benefit by using resource alternatively.

Question 2

a. Working Note (2 marks)

Details	Working	Amount (Rs.)
	Rs.	
Selling Price	4,99,200	416

	1,200 units	
Raw Materials	Rs.1,68,000 1,400 units	120
Labour *Equivalent units (1,400 units / 80%)*	Rs.1,05,000 1,750 units *	60
Variable Overheads	Rs.42,000 1,400 units	30
Manufacturing Cost (Variable) [Rs.120 + Rs.60 + Rs.30]		210
Distribution Overheads	Rs.19,200 1,200 units	16
Total Variable Cost [Rs.210 + Rs.16]		226
Contribution [Rs.416 - Rs.226]		190
Fixed Cost Factory Administration Selling	 Rs. 1,20,000 Rs. 40,000 Rs. 40,000	 2,00,000

Standard Profit for 1,200 Units Sold (2 marks)

Details	Working	Amount (Rs.)
Contribution	1,200 units Rs. 190	2,28,000
Less: Fixed Costs		2,00,000
Profit		28,000

Reconciliation between Budgeted and Actual Profit (2 marks)

Details	Working	Amount (Rs.)
Budgeted Profit	(2,000 units Rs. 190 – Rs. 2,00,000)	1,80,000
Less: Volume variance	(800 units Rs.190)	1,52,000
Standard Profit		28,000
Factors causing loss:		
Units Scrapped	(100 units Rs.210)	21,000
Labour Inefficiency	(350 units Rs.60)	21,000
Undervaluation of Closing Stock	{100 units (Rs.210 – Rs.180)}	3,000
Actual Profit		(-)17,000

b.
Workings:

(1) All Overheads for one carton or 24*cans* `27
Therefore, per *can* Overheads (`27/24) 1.125
Fixed Overheads Allocated for 1,50,000 *cans* `112,500
Per *can* Fixed Overheads (`1,12,500 / 1,50,000 *cans)* `0.75
Variable Overheads per *can* (`1.125 – `0.75) `0.375

(2) Direct Wage per carton `36
Per *can* (`36/24) `1.50

(3) Direct Materials per carton ` 54
Per *can* (`54/24) `2.25

(4) Cost of making one empty *can*: **(2 marks)**

	Cost per *can* of 'EXE' (`)	Cost % empty *can*	Cost empty *can* (`)	Cost of per *can* of 'EXE' without empty *can* (`)
Direct Material	2.250	20	0.4500	1.8000
Direct Wages	1.500	10	0.1500	1.3500
Variable Overheads	0.375	10	0.0375	0.3375
Total	4.125		0.6375	3.4875

(5) Cost of manufacturing/buying of 1,50,000 empty *cans* of 'EXE':

	Empty *can* Cost (`)	If empty *can* made (`)	If empty *can* purchased (`)
Direct Material	0.4500	67,500.00	-----
Direct Wages	0.1500	22,500.00	-----
Variable Overheads	0.0375	5,625.00	-----
Purchase Price	0.6750	-----	1,01,250.00
Total		95,625.00	1,01,250.00

Company should manufacture the empty *cans* for a production volume of 1,50,000 'EXE' *cans* as capacity is available and cost of manufacture is lower. **(1 mark)**

(6) After the level of 1,50,000 empty *cans*, the company has to install a new machine involving a total additional Fixed Overheads of ` 7,500. The cost of making and buying the additional *cans* of 25,000 and 75,000 will be as follows:

	Cost per *can* (`)	Make (`)	Buy (`)	Make (`)	Buy (`)
		25,000 *cans*		75,000 *cans*	
Direct Material	0.4500	11,250.00	-----	33,750.00	-----
Direct Wages	0.1500	3,750.00	-----	11,250.00	-----
Variable Overheads	0.0375	937.50	-----	2,812.50	-----
Additional Overheads		7,500.00	-----	7,500.00	-----

Purchase Price	0.6750	-----	16,875.00	-----	50,625.00
Total		23,437.50	16,875.00	55,312.50	50,625.00

The cost of buying additional empty *cans* at both the levels is lower than the cost of their manufacture. **(2 marks)**

- If the company increases production to 1,75,000 *cans* of 'EXE', 1,50,000 empty *cans* should be manufactured and additional 25,000 *cans* should be purchased at `16,875 [Refer W.N. 5&6]

  If the company increases production to 2,25,000 *cans* of 'EXE', 1,50,000 empty *cans* should be manufactured and additional 75,000 *cans* should be purchased at a cost of ` 50,625. [Refer W.N. 5&6] **(1 mark)**
- Additional fixed overheads to be incurred on a new machine: `7,500 Savings per unit if empty *cans* are made instead of buying:

  ` 0.675 – ` 0.6375 = ` 0.0375

  Minimum additional quantity of empty *cans* to be made to recover the additional fixed costs:

  `7,500/ `0.0375 = 2,00,000 empty *cans*

  Installation of the new machine for the manufacture of empty *cans* will be economical at production level of 3,50,000 *cans* per month . **(1 mark)**

(c) Evaluation of the profitability on sale of "EXE" at the three levels.**(3 marks)**

	Per *can* (`)	1,50,000 *can* (`)	1,75,000 *can* (`)	2,25,000 *can* (`)
Sales	5.0000	7,50,000.00	8,75,000.00	11,25,000.00
Less: Direct Material	1.8000	2,70,000.00	3,15,000.00	4,05,000.00
Direct Wages	1.3500	2,02,500.00	2,36,250.00	3,03,750.00
Variable Overheads	0.3375	50,625.00	59,062.50	75,937.50
Empty *can* made	0.6375	95,625.00	95,625.00	95,625.00
Empty *can* purchases	0.6750		16,875.00	50,625.00
Net Gain		1,31,250.00	1,52,187.50	1,94,062.50

Question 3

a.

Cost is not only criterion for deciding in the favour of *shut down*. **Non-Cost Factors** worthy of consideration in this regard are as follows:

- Interest of workers, if the workers are discharged, it may become difficult to get skilled workers later, on reopening of the factory. Also shut-down may create problems. **(2 marks)**
- In the face of competition it may difficult to re-establish the market for the product. **(1 mark)**

- Plant may become obsolete or depreciate at a faster rate or get rusted. Thus, heavy capital expenditure may have to be incurred on re-opening. **(1 mark)**

b. Both Standard Costing and Kaizen Costing are helpful and used for measurement of performance of a company but there are differences in approach between the two systems.

Under Standard Costing system standards of all important variables like cost and quantity of materials, labours and overheads are set at the beginning of the year or activity. These set standards are compared with the actual performance to analyse the variances. As a step further all variances are classified as planning and operational variances to distinguish variances that are with in the manager's control and beyond their effort. In brief Standard Costing and Variance Analysis helps in determine the variances and take post event measures to stop recurrences. **(2 marks)**

On the other hand Kaizen Costing emphasises on continual improvement. Targets once set at the beginning of the year or activities are updated continuously to reflect the improvement that has already been achieved and that are yet to be achieved. **(1 mark)**

As a continuous improvement measure Kaizen Costing set new challenges before the workers and managers and helps to improve and control the situation to achieve desired target results. Therefore, if Kaizen costing is used in place of Standard Costing and Variance analysis to measure performance then definitely it will keep Arnav Automobile Ltd. competent enough to head on with the global automobile players. **(1 mark)**

c.

(a) 1. Projected Raw Material Issues (Kg): (2 marks)

	'A'	'B'	'C'
'X' (48,000 units-Refer Note)	60,000	24,000	---
'Y' (36,000 units-Refer Note)	72,000	-	54,000
Projected Raw Material Issues	1,32,000	24,000	54,000

Note:

- Based on this experience and the projected sales, the BIML has budgeted production of 48,000 units of 'X' and 36,000 units of 'Y' in the sixth period.
  =52,500 x 40% + 45,000 – 18,000 = 48,000
  =27,000 x 40% + 42,000 – 16,800 = 36,000
- Production is assumed to be uniform for both products within each four-week period.

2 and 3. Projected Inventory Activity and Ending Balance (Kg): (4 marks)

	'A'	'B'	'C'
Average Daily Usage	6,600	1,200	2,700
Beginning Inventory	96,000	54,000	84,000

Orders received:			
Ordered in 5th period	90,000	-	60,000
Ordered in 6th period	90,000	-	-
Sub Total	276,000	54,000	144,000
Issues	132,000	24,000	54,000
Projected ending inventory balance	144,000	30,000	90,000

Note:

- Ordered 90,000 Kg of 'A' on fourth working day.
- Order for 90,000 Kg of 'A' ordered during fifth period received on tenth working day.
- Order for 90,000 Kg of 'A' ordered on fourth working day of sixth period received on fourteenth working day.
- Ordered 30,000 Kg of 'B' on eighth working day.
- Order for 60,000 Kg of 'C' ordered during fifth period received on fourth working day.
- No orders for 'C' would be placed during the sixth period.

4. Projected Payments for Raw Material Purchases: (2 marks)

Raw Material	Day/Period Ordered	Day/Period Received	Quantity Ordered	Amount Due	Day/Period Due
'A'	20th/5th	10th /6th	90,000 Kg	` 90,000	20th/6th
'C'	4th/5th	4th /6th	60,000 Kg	` 60,000	14th/6th
'A'	4th/6th	14th /6th	90,000 Kg	` 90,000	4th/7th
'B'	8th/6th	13th /7th	30,000 Kg	` 60,000	3rd /8th

Question 4

a.

(i) Should the Division X reduce the selling price by ` 20 per unit…?

Statement Showing 'Impact of Selling Price Reduction' (4 marks)

Particulars		`
Incremental Revenue		
Additional Sales Revenue (9,600 units × ` 180)		17,28,000
Loss of Revenue (30,000 units × ` 20)		(6,00,000)
	Total (A)	11,28,000
Incremental Cost		
Component Purchase Costs (9,600 units × ` 35)		3,36,000
Other Variable Costs	9,600 units × ` 16,80,000 / 30,000 units	5,37,600
Variable Marketing Costs	9,600 units × ` 2,70,000 / 30,000	86,400

units	
Total (B)	9,60,000
Savings/ (Loss) …(A) (B)	1,68,000

Advice

Above *incremental analysis* clearly indicates that the reduction ofSelling Price by ` 20 per unitshall be acceptedas it increases theProfit of the concern by ` 1,68,000.

(ii) Should the Division Y be willing to supply 39,600 units to Division X…? (4 marks)

Statement Showing 'Minimum Average Transfer Price' *per component* (39,600)

Particulars	`
Variable Cost	15.00
Loss of Contribution* [14,600 units × (` 50 - ` 15 - ` 3)/ 39,600 units]	11.80
Transfer Price	26.80

(*) Division Y has surplus apacity to the extent of 25,000 units, for additional 14,600 units the Transfer Price must consider the Division Y's Variable Costs of Manufacturing the Component *plus* the Lost Contribution Margin(that will result from *losing outside sales*).

Company's Perspective

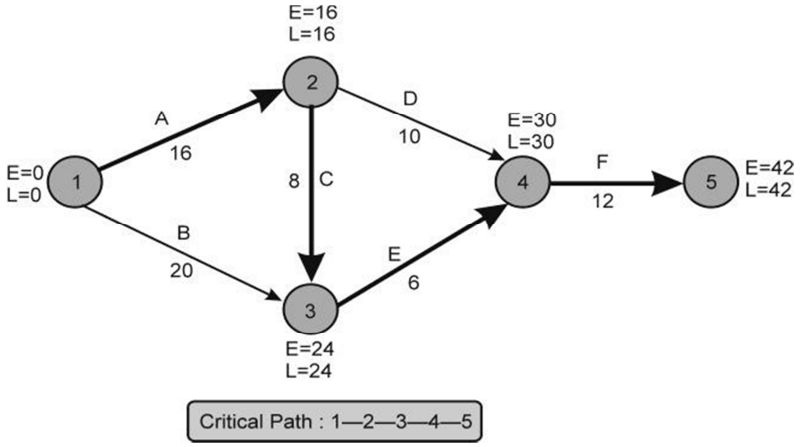
Particulars	`
Market Price *per component*	35.00
Relevant Cost for Transfer *per component* (from above)	26.80
Saving *per component*	8.20
Units	39,600
Total Savings	3,24,720

Advice

It is not in the interest of the Division Y to transfer 39,600 units to Division X at Price below the Minimum Average Transfer Price based on Opportunity Cost. However, from the Concern's Perspective, internal transfer between Divisions is beneficial as each unit to be transferred is offering a saving of ` 8.20.

b.

(i) (i) The **Network** for the given problem: (2 marks)



(ii) **Critical Path**: 1–2–3–4–5 (A–C–E–F). (1 mark)

(iii) Total Float and Free Float for each activity: (5 marks)

Activity	Duration	EST	EFT	LST	LFT	Slack of Tail Event	Slack of Head Event	Total Float	Free Float
	D_{ij}	E_i	$E_i + D_{ij}$	$L_j - D_{ij}$	L_j	$L_i - E_i$	$L_j - E_j$	LST – EST	Total Float – Slack of Head Event
A (1–2)	16	0	16	0	16	0	0	0	0
B (1–3)	20	0	20	4	24	0	0	4	4
C	8	16	24	16	24	0	0	0	0

(2–3)									
D (2–4)	10	16	26	20	30	0	0	4	4
E (3–4)	6	24	30	24	30	0	0	0	0
F (4–5)	12	30	42	30	42	0	0	0	0

Question 5

a.

Customer Profitability Statement (8 marks)

Particulars		MT Ltd.	KG Ltd.	MG Bros.
Sales (units)		2,000	1,000	800
		(`)	(`)	(`)
Sales Revenue	(A)	2,20,00,000	1,10,00,000	88,00,000
Less: Average Variable Cost (` 5,500 × 60% = 3,300 p.u.)	(B)	66,00,000	33,00,000	26,40,000
Contribution [70%of Sales]	(A)-(B)	1,54,00,000	77,00,000	61,60,000
Less: Additional Overheads				
Delivery Cost (No. of K.M. × ` 200)		2,00,000	1,60,000	1,80,000
Emergency Delivery Cost (No. of Emergency Delivery × ` 21,000)		42,000	21,000	-
Order Processing Cost (No. of Orders × ` 6,000)		24,000	12,000	48,000

Specific Discount	55,00,000	22,00,000	13,20,000
Sales Commission	33,00,000	11,00,000	4,40,000
Advertisement Cost	8,75,000	6,15,000	4,30,000
Profit *per customer**	54,59,000	35,92,000	37,42,000
Profit Margin *per customer** (%)	24.81%	32.65%	42.52%
Rank	III	II	I

* Before deducting general fixed overhead cost

The contribution margin is 70% for each customer but when the other overheads costs per customer is included in the above profitability statement the profitability of the three customers become different. MG Bros. is the most profitable customer.

b.

Working for Finding – Missing Figures

Cost Variance $_{A}$ = 0

Cost Variance $_{(A+B)}$ = ` 1,300 (A)

Yield Variance $_{(A+B)}$ = ` 270 (A)

Standard Cost and Actual Cost (Incomplete Information)

Raw Material	Standard Data			Actual Data		
	Qty. (Kg.) [SQ]	Price (₹) [SP]	Amount (₹) [SQ x SP]	Qty. (Kg.) [AQ]	Price (₹) [AP]	Amount (₹) [AQ x AP]
A	? ??	24	? ? ?	? ? ?	30	? ? ?
B	? ??	30	? ? ?	70	? ? ?	? ? ?
Total	? ? ?		? ??	? ??		? ? ?

Material Cost Variance $_{A}$ = Standard Cost – Actual Cost

$\Rightarrow$ 0 = (SQ_A × ` 24 – $AQ_A$ × ` 30)

$\Rightarrow$ SQ_A = 1.25 AQ_A

Material Yield Variance $_{(A+B)}$ = *Average* Standard Price *per unit* of Standard Mix × [Total Standard Quantity (units) – Total Actual Quantity (units)]

$$\Rightarrow \text{`}270\ (A) = \frac{\text{`}24 \times SQ_A + \text{`}30 \times SQ_B}{SQ_A + SQ_B} \times [(SQ_A + SQ_B) - (AQ_A + 70)]$$

SQ_A = SQ_B as Standard Mix is in ratio 1:1

$$\Rightarrow \text{`}\ 270\ (A) = \frac{\text{`}24 \times SQ_A + \text{`}30 \times SQ_A}{SQ_A + SQ_A} \times [(SQ_A + SQ_A) - (AQ_A + 70)]$$

$\Rightarrow$ ` 270 (A) =27 × [2 x SQ_A – (AQ_A+70)]

$\Rightarrow$ ` 270 (A) = 27 × [2 x 1.25 AQ_A– (AQ_A+70)]

$\Rightarrow AQ_A$ = 40 Kg.

As SQ_A = 1.25 AQ_A

	=	1.25 × 40 Kg.
	=	50 Kg.
As SQ_B	=	SQ_A
	=	50 Kg.
Cost Variance $_{(A+B)}$	=	Standard Cost – Actual Cost
⇒ 1,300 (A)	=	(50 Kg. × ` 24 + 50 Kg. × ` 30) – (40 Kg. ×` 30 +70 Kg. × AP_B)
⇒ AP_B	=	` 40 **(2 marks)**

Standard Cost and Actual Cost (Complete Information)

Raw Material	Standard Data			Actual Data			Std. Cost of Actual Qty. (₹) [AQ x SP]
	Qty. (Kg.) [SQ]	Price (₹) [SP]	Amount (₹) [SQ x SP]	Qty. (Kg.) [AQ]	Price (₹) [AP]	Amount (₹) [AQ x AP]	
A	50	24	1,200	40	30	1,200	960
B	50	30	1,500	70	40	2,800	2,100
Total	100		2,700	110		4,000	3,060

Computation of Variances **(1 mark for each variance)**

Material Cost Variance	=	Standard Cost – Actual Cost
	=	SQ × SP – AQ × AP
(A)	=	` 1,200 – `1,200
	=	` 0
(B)	=	` 1,500 – `2,800
	=	` 1,300 (A)
Total	=	` 0 + `1,300 (A)
	=	` 1,300 (A)
Material Price Variance	=	Standard Cost of Actual Quantity – Actual Cost
	=	AQ × SP – AQ × AP
		Or
	=	AQ × (SP – AP)
(A)	=	40 Kg. × (` 24.00 – ` 30.00)
	=	` 240 (A)

□

(B)	=	70 Kg. × (` 30.00 – ` 40.00)
	=	` 700 (A)
Total	=	` 240 (A) + ` 700 (A)
	=	` 940 (A)
Material Usage Variance	=	Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity
	=	SQ × SP – AQ × SP
		Or
	=	SP × (SQ – AQ)
(A)	=	` 24 × (50 Kg. – 40 Kg.)
	=	` 240 (F)
(B)	=	` 30 × (50 Kg. – 70 Kg.)
	=	` 600 (A)
Total	=	` 240 (F) + ` 600 (A)
	=	` 360 (A)
Material Mix Variance	=	Total Actual Quantity (units) × (*Average* Standard Price *Per unit* of Standard Mix – Average Standard Price *per unit*of Actual Mix)
	=	$110\ \text{Kg.} \times \frac{2,700}{100\ \text{Kg.}} \quad \frac{3,060}{110\ \text{Kg.}}$
	=	` 90 (A)
Material Yield Variance	=	*Average* Standard Price *per unit* of Standard Mix × [Total Standard Quantity (units) – Total Actual Quantity (units)]
	=	$\frac{2,700}{100\ \text{Kg.}} \times (100\ \text{Kg.} - 110\ \text{Kg.})$
	=	` 270 (A) (Given)
Standard Output	=	Standard Input – Standard Loss
	=	100 Kg. – 10 Kg.
	=	90Kg.
Actual Output	=	90 Kg.

(Actual Output and Standard Output are always equal numerically in any Material Variance Analys

a.

Cumulative Average Time for 256 parts = 48.43 hrs.*
[$112.50 \times (0.90_8)$]

Total Time for 256 parts = 12,398.08 hrs.
[48.43 hrs.× 256 parts]

Total Labour Cost of 256 parts = ` 2,47,961.60
[12,398.08 hrs.× ` 20]

Revised Labour Cost for *zero profit* = ` 3,22,961.60
[` 2,47,961.60 + ` 75,000]

Total Time for 256 parts (Revised) = 16,148.08 hrs.
[` 3,22,961.60/` 20]

Cumulative Average Time for 256 parts (Rev.) = 63.08 hrs.
[16,148.08/256]

The usual learning curve model is

$$y = ax^b$$

Where

y = Cumulative Average Time per part for x parts
a = Time required for first part
x = Cumulative number of parts
b = Learning coefficient (log r/log 2)

Accordingly

$63.08 = 112.50 \times (256)^b$

$0.5607 = 2_{8b}$

$\log 0.5607 = \log 2_{8b}$

$\log 0.5607 = 8 \times b \times \log 2$

$\log 0.5607 = 8 \times \frac{\log r}{\log 2} \times \log 2$

$\log 0.5607 = 8 \log r$

$\log 0.5607 = \log r_8$

$0.5607 = r_8$

$r = \sqrt[8]{0.5607}$

$r = 0.9302$

Learning Rate (r) = 93.02%.

Therefore

Sensitivity = 3.02/90
= 3.36%

Students may also take 48.38 hrs. (112.50 0.43)

Question 6

a.

(i) Statement Showing "Profitability of Product A & B"

Particulars	Product A 15,000 units (₹)	Product B 15,000 units (₹)
Contribution	6,00,000 (15,000 units × ₹40)	7,50,000 (15,000 units × ₹50)
Less: Setup Cost	32,000 (8 runs × ₹4,000)	90,000 (12 runs × ₹7,500)
Less: Distribution Cost	60,000 (500 boxes × ₹120)	24,000 (120 boxes × ₹200)
Less: Step Fixed Cost	32,000 (8 × ₹4,000)	75,000 (15 × ₹5,000)
Less: Un-analyzed Fixed Cost	32,000	32,000
Profit	4,44,000	5,29,000

(6 marks)

(ii) Break Even Point "A"

Un-analyzed Fixed Cost is ₹ 32,000

$$\text{Minimum units for BEP} = \frac{₹\ 32,000}{₹\ 40}$$

$$= 800 \text{ units}$$

Setup Cost (fixed for 2,000 units); 1 Production Run; ₹ 4,000/-

Step Cost (fixed for 2,000 units); ₹ 4,000/-

Distribution Cost will have to be recovered on the basis of 30 units.

Let BEP (units) - 'K'

$$40 \times K = ₹\ 32,000 + ₹\ 8,000 + \left(\frac{K}{30 \text{ units}}\right) \text{Boxes} \times ₹120$$

$$K = 1,111.11 \text{ units}$$

Refining, 1,111.11 will have 37.03 boxes or say 38 boxes. The last box will cost ₹ 120 which is *equivalent to* contribution from 3 units. Hence, **BEP** is **1,114 units**.

(6 marks)

b.

Statement Showing Target Cost "Z"

	₹ / Toy
Target Selling Price	100.00
Less: Royalty @15%	15.00
Less: Profit @ 25%	25.00
Target Cost	60.00

Statement Showing Cost Structure "Z"

	₹ / Toy
Component A	8.50
Component B	7.00
Labour (0.40 hr. × ₹ 60 per hr.)	24.00
Product Specific Overheads	13.50
Other Material (0.6 kg / 96% × ₹16)	10.00
Total Cost of Manufacturing	63.00

Total Cost of Manufacturing is ₹ 63 while Target Cost is ₹ 60. Company "T" should make efforts to **reduce its manufacturing cost by ₹ 3** to achieve Target Selling Price of ₹100.

(2 marks for each)

Question 7

*Attempt any **four** of the following*

a.

Throughput Contribution **(1 mark**)	Raw Material for Production
	Sales
Operating Costs**(11/2 marks)**	Rent / Utilities
	Depreciation
	Labour
Investments**(11/2 marks)**	Research and Development Cost
	Raw Material Stock
	Building and Equipment Cost

b.

Let y_1, y_2, y_3 be the number of units produced of products P, Q and R respectively.

Objective function:

Then the profit gained by the industry is given by

$$Z = 3y_1 + 8y_2 + 2y_3$$

Here it is assumed that all the units of products P and Q are sold.

Condition-1:

In first operation, P takes 3 hrs of manufacturer's time and Q takes 4 hrs of manufacturer's time. Therefore, total number of hours required in first operation becomes-

$$3y_1 + 4y_2$$

In second operation, per unit of P takes 3 hrs of manufacturer's time and per unit Q takes 5 hrs of manufacturer's time. Therefore, the total number of hours used in second operation becomes

$$3y_1 + 5y_2$$

Since there are 18 hrs available in first operation and 21 hrs in second operation, the restrictions become

$$3y_1 + 4y_2 \leq 18$$

$$3y_1 + 5y_2 \leq 21$$

Condition-2:

Since the maximum number of units of R that can be sold is 5, therefore, y_3

$$\leq 5$$

Condition-3:

Further, the company gets three units of by product R for every unit of product Q produced, therefore

$$y_3 = 3y_2$$

Now, the allocation problem of the industry can be finally put in the following linear programming problem:

Maximise

$Z = 3y_1 + 8y_2 + 2y_3$ (1 mark)

Subject to the Constraints:

$3y_1 + yx_2 \leq 18$ (1 mark)

$3y_1 + 5y_2 \leq 21$ (1 mark)

$y_3 \leq 5$ (1/2 mark)

$y_3 = 3y_2$ (1/2 mark)

$y_1, y_2, y_3 \geq 0$

c.

Use of **Monte Carlo Simulation** can be explained with the following steps involved in the method:

i. Define the problem and select the measure of effectiveness of the problem that might be inventory shortages per period.
ii. Identify the variables which influence the measure of effectiveness significantly for example, number of units in inventory.
iii. Determine the proper cumulative probability distribution of each variable selected with the probability on vertical axis and the values of variables on horizontal axis.
iv. Get a set of random numbers.
v. Consider each random number as a decimal value of theumulativec probability distribution with the decimal enter the cumulative distribution plot from the vertical axis. Project this point horizontally, until it intersects cumulative probability distribution curve. Then project the point of intersection down into the vertical axis.
vi. Then record the value generated into the formula derived from the chosen measure of effectiveness. Solve and record the value. This value is the measure of effectiveness for that simulated value. Repeat above steps until sampleis large enough for the satisfaction of the decision maker.

(4 marks)

d.

JIT approach helps in the reduction of costs/increase in prices as follows:

i. Immediate detection of defective goods being manufactured so that early correction is ensured with least scrapping.
ii. Eliminates / reduces WIP between machines within working cell.
iii. Overhead costs in the form of rentals for inventory, insurance, maintenance costs etc. are reduced.
iv. Higher product quality ensured by the JIT approach leads to higher premium in the selling price.

Detection of problem areas due to better production / scrap reporting / labour tracing and inventory accuracy lead to reduction in costs by improvement. **(4 marks)**

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. **(2 marks)**

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. **(2 marks)**

****