



**J.K. SHAH**<sup>®</sup>  
**TEST SERIES**  
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**SUGGESTED SOLUTION**

**FINAL MAY 2019 EXAM**

**SUBJECT- AMA**

**Test Code – FNJ 7167**

**BRANCH - () (Date :)**

**Head Office : Shraddha, 3<sup>rd</sup> Floor, Near Chinai College, Andheri (E), Mumbai – 69.**

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**Answer 1:**

**(A)**

**Statement Showing "Cost and Profit for the Next Year"**

Particulars	Existing Volume, etc.	Volume, Costs, etc. after 10% Increase	Estimated Sale, Cost, Profit, etc.*
	(Rs.)		
Sales	5,00,000	5,50,000	5,72,000
<b>Less : Direct Materials</b>	2,50,000	2,75,000	2,69,500
Direct Labour	1,00,000	1,10,000	1,07,800
Variable Overheads	40,000	44,000	43,120
Contribution	1,10,000	1,21,000	1,51,580
Less : Fixed Cost <sup>#</sup>	60,000	60,000	58,800
Profit	50,000	61,000	92,780

(\*) for the next year after increase in selling price @ 4% and overall cost reduction by 2%.

(#) Fixed Cost = Existing Sales – Existing Marginal Cost – 12.5% on Rs. 4,00,000

= Rs. 5,00,000 – Rs. 3,90,000 – Rs. 50,000

= Rs. 60,000

**(4 marks)**

Percentage Profit on Capital Employed equals to 23.19%  $\left(\frac{Rs.92,780}{Rs.4,00,000} \times 100\right)$  **(0.5 mark)**

Since the Profit of Rs. 92,780 is more than 23% of capital employed, the proposal of the Sales Manager can be adopted. **(0.5 mark)**

**(B)**

**Statement Showing 'Pareto Analysis'**

Model	Sales (Rs. '000)	% of Total Sales	Cumulative Total	Model	Cont. (Rs.'000)	% of Total Cont.	Cumulative Total%
<b>Pareto Analysis Sales</b>				<b>Pareto Analysis Contribution</b>			
A001	5,100	35.05%	35.05%	B002	690	30.87%	30.87%
B002	3,000	20.62%	55.67%	E005	435	19.47%	50.34%
C003	2,100	14.43%	70.10%	C003	300	13.42%	63.76%
D004	1,800	12.37%	82.47%	D004	255	11.41%	75.17%
E005	1,050	7.22%	89.69%	F006	195	8.73%*	83.90%
F006	750	5.15%	94.84%	A001	180	8.05%	91.95%
G007	450	3.09%	97.93%	G007	120	5.37%	97.32%
H008	225	1.55%	99.48%	I009	45	2.01%	99.33%
I009	75	0.52%	100.00%	H008	15	0.67%	100.00%
	14,550	100.00%			2,235	100.00%	

(\*) Rounding – off difference adjusted.

**(5 marks)**

(C)

The given problem is a balanced minimization assignment problem.

The minimum time elements in row 1, 2 and 3 are 70, 50 and 110 respectively. Subtract these elements from all elements in their respective row. The reduced matrix is shown below-

	A	B	C
1	30	15	0
2	0	20	60
3	0	10	20

The minimum time elements in columns A, B and C are 0, 10, and 0 respectively. Subtract these elements from all the elements in their respective columns to get the reduced time matrix as shown below-

	A	B	C
1	30	5	0
2	0	10	60
3	0	0	20

The minimum number of horizontal and vertical lines to cover all zeros is 3, which is equal to the order of the matrix.

The Pattern of assignments among software professionals and programs with their respective time (in minutes) is given below-

Program	Software Professionals	Time (in Minutes)
1	C	70
2	A	50
3	B	120
Total		240

(5 marks)

(D)

Sl. No.	Statements	Valid or Invalid
(i)	In the introduction stage, usual marketing strategy is to strengthen the supply chain relationships to make the product easily accessible by target customers.	Valid
(ii)	In the introduction stage, competitors will purchase the product to carry out reverse engineering and understand how the product works, so that they can develop their own similar, but different product.	Valid

(iii)	In the introduction phase, the firm will seek to avoid this competition by maintaining its selling price at the end of the introduction stage.	Invalid
(iv)	In the growth stage, if the product cannot be differentiated in other ways, the firm may need further reductions in selling price to maintain growth.	Valid
(v)	In the maturity stage, firms are tempted to engage in costly promotional price wars to wean away market share from competitors.	Valid

(1 mark x 5 = 5 marks)

**Answer 2:**

**(A)**

**Statement Showing 'Inventory Holding Cost' under Current System**

Particulars	Jan	Feb	Mar	Apr	May	Jun
Opening Inventory* (A)	---	650	690	430	880	1,030
Add: Production*	3,800	3,800	3,800	3,800	3,800	3,800
Less: Demand*	3,150	3,760	4,060	3,350	3,650	4,830
Closing Inventory* (B)	650	690	430	880	1,030	-
Average Inventory (A + B) / 2	325	670	560	655	955	515
Inventory Holding Cost @ Rs.70	22,750	46,900	39,200	45,850	66,850	36,050

(2 marks)

(\*) in terms of standard labour hours

Inventory Holding Cost for the six months = Rs.2,57,600

(Rs. 22,750 + Rs. 46,900 + Rs. 39,200 +  
Rs. 45,850 + Rs. 66,850 + Rs. 36,050)

(1 mark)

**Calculation of Relevant Overtime Cost under JIT System**

Particulars	Jan	Feb	Mar	Apr	May	Jun
Demand*	3,150	3,760	4,060	3,350	3,650	4,830
Production*	3,150	3,760	4,060	3,350	3,650	4,830
Normal Availability*	3,800	3,800	3,800	3,800	3,800	3,800
Shortage (=Overtime*) (C)	---	---	260	---	---	1,030
Actual Overtime Hours (C / 0.95)	---	---	273.68	---	---	1,084.21
Overtime Payment @ Rs.159.50 [110+45%]	---	---	43,652	---	---	1,72,931

(3 marks)

(\*) in terms of standard labour

hours

$$\begin{aligned} \text{Total Overtime payment} &= \text{Rs. 2,16,583} \\ & \quad (\text{Rs. 43,652} + \text{Rs. 1,72,931}) \\ \text{Therefore, saving in JIT system} &= \text{Rs. 2,57,600} - \text{Rs. 2,16,583} = \\ & \quad \text{Rs. 41,017} \end{aligned}$$

(1 mark)

**Decision:**

Since there can be saving of Rs.41,017 by implementing Just in time system, we recommend to implement the same. (1 mark)

(B)

**Customer Profitability Statement**

Particulars	WX Ltd.	WY Ltd.	XY Bros.
<b>Sales (units)</b>	<b>2,000</b>	<b>1,000</b>	<b>800</b>
	(Rs.)	(Rs.)	(Rs.)
Sales Revenue (A)	2,20,00,000	1,10,00,000	88,00,000
Less: Average Variable Cost (B) (Rs. 5,500 × 60% = 3,300 p.u.)	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. × Rs. 200)	2,00,000	1,60,000	1,80,000
Emergency Delivery Cost (No. of Emerg. Delivery × Rs. 21,000)	42,000	21,000	-
Order Processing Cost (No. of Orders × Rs. 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. XY Bros. is the most profitable customer. (8 marks)

**Answer 3:**  
**(A)**

**Random No. Allocation**

Demand (Units/ day)	Probability	Cumulative Probability	Random Numbers
15	0.25	0.25	00 – 24
16	0.20	0.45	25 – 44
17	0.15	0.60	45 – 59
18	0.18	0.78	60 – 77
19	0.12	0.90	78 – 89
20	0.10	1.00	90 – 99

**(1.5 marks)**

**Simulation Sheet**

Day	R. No. of Demand	Opening Stock	Demand	Sales Pcs.	Balance	Order Received	Total Closing Inventory	Order Initiated	Stock Out
1	49	52	17	17	35	---	35	50	---
2	39	35	16	16	19	---	19	---	---
3	94	19	20	19	---	50	50	---	1
4	16	50	15	15	35	---	35	50	---
5	81	35	19	19	16	---	16	---	---
6	60	16	18	16	---	50	50	---	2
7	92	50	20	20	30	---	30	50	---
8	63	30	18	18	12	---	12	---	---
9	13	12	15	12	---	50	50	---	3
10	73	50	18	18	32	---	32	50	---
	349		329		6				

**(3.5 marks)**

**Statement Showing 'Total Cost of Inventory'**

	Amount (Rs.)
Carrying Cost {349 units + 329 units}/2 × Rs.2.40}	813.60
Ordering Cost (4 Orders × Rs.150)	600.00
Stock Out Cost (6 units × Rs.125)	750.00
<b>Total</b>	<b>2,163.60</b>

**(1 mark)**

**(B)**

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:

- (i) **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.

- (ii) In the face of competition it may **difficult to re-establish the market** for the product.
- (iii) **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. **(3 marks)**

(C)

(i) **Workings**

**Statement Showing 'Computation of Variable Cost'**

		Dept. A	Dept. B	Total(Rs.)
Direct Material	Dept. A (8 kg × Rs. 4)	32.00	---	
	Dept. B (4 kg × Rs. 6)	---	24.00	56.00
Direct Labour	Dept. A (2 hrs × Rs.14)	28.00	---	
	Dept. B (3 hrs × Rs.12)	---	36.00	64.00
Variable Overhead	Dept. A (0.80 × Rs.32)	25.60	---	
	Dept. B (3 hrs × Rs.2)	---	6.00	31.60
Total Variable Cost <i>per unit</i>				151.60

**(1.5 marks)**

**Statement Showing 'Desired Contribution on Investment (Department A)'**

**(Rs.)**

Investment in Plant & Machinery		22,00,000
Desired Contribution (25% of investment) ... (A)		5,50,000
Material Required (2,000 units × 8kg. × Rs. 4)		64,000
Material Required at 100% Capacity <i>p.m.</i> $\frac{64,000}{40\%}$		1,60,000
Material Required at 100% Capacity <i>p.a.</i> (Rs. 1,60,000 × 12) ... (B)		19,20,000
Contribution <i>per rupee of material</i> ... (A)/(B)		0.2865

**(1.5 marks)**

**Statement Showing 'Desired Contribution on Investment (Department B)'**

Investment in Plant & Machinery		Rs. 18,00,000
Desired Contribution (25% of investment) ... (A)		Rs. 4,50,000
Hours Required (2,000 units × 3hrs)		6,000 hrs.
Total Capacity <i>p.m.</i> (60000 / 40%)		15,000 hrs.
Total Capacity <i>p.a.</i> (15,000 hrs. × 12) ... (B)		1,80,000 hrs.
Contribution <i>per hour</i> ... (A)/(B)		Rs. 2.50

**(1.5 marks)**

**Statement Showing 'Desired Contribution on Working Capital'**

Return on Working Capital (Rs. 2,72,800 × 25%) ... (A)	Rs. 68,200
Target Volume of Output p.a. (Rs. 2,000 units × 12) ... (B)	24,000 units
Contribution <i>per unit</i> ... (A)/ (B)	Rs. 2.8417

(0.5 mark)

**Statement Showing 'Desired Contribution'**

Particulars	Rs.
Capital Investment	
Dept. A (Rs. 0.2865 × Rs. 32)	9.17
Dept. B (Rs. 2.50 × 3 hrs.)	7.50
Working Capital	2.84
Contribution <i>per unit</i>	19.51

(1 mark)

Price of Product is Rs. 171.11 per unit.

$$= [\text{Variable Cost (Rs. 151.60)} + \text{Contribution Required (Rs. 19.51)}]$$

(1 mark)

**Answer 4:**

(A)

**Working Note**

**The usual learning curve model is**

$$y = ax^b$$

Where

y = Average time per unit for x units

a = Time required for first unit

x = Cumulative number of units produced

b = Learning coefficient

**W.N.1**

**Time required for first 15 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$y = 10 \times (15)^{-0.322}$$



$$\begin{aligned} \log y &= \log 10 - 0.322 \times \log 15 \\ \log y &= \log 10 - 0.322 \times \log (5 \times 3) \\ \log y &= \log 10 - 0.322 \times [\log 5 + \log 3] \\ \log y &= 1 - 0.322 \times [0.69897 + 0.47712] \\ \log y &= 0.6213 \\ y &= \text{antilog of } 0.6213 \\ y &= 4.181 \text{ hours} \end{aligned}$$

$$\begin{aligned} \text{Total time for 15 units} &= 15 \text{ units} \times 4.181 \text{ hours} \\ &= 62.72 \text{ hours} \end{aligned}$$

**Time required for first 14 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$\begin{aligned} y &= 10 \times (14)^{-0.322} \\ \log y &= \log 10 - 0.322 \times \log 14 \\ \log y &= \log 10 - 0.322 \times \log (2 \times 7) \\ \log y &= \log 10 - 0.322 \times [\log 2 + \log 7] \\ \log y &= 1 - 0.322 \times [0.3010 + 0.8451] \\ \log y &= 0.63096 \end{aligned}$$

$$\begin{aligned} \log y &= \log 10 - 0.322 \times \log 15 \\ \log y &= \log 10 - 0.322 \times \log (5 \times 3) \\ \log y &= \log 10 - 0.322 \times [\log 5 + \log 3] \\ \log y &= 1 - 0.322 \times [0.69897 + 0.47712] \\ \log y &= 0.6213 \\ y &= \text{antilog of } 0.6213 \\ y &= 4.181 \text{ hours} \end{aligned}$$

$$\begin{aligned} \text{Total time for 15 units} &= 15 \text{ units} \times 4.181 \text{ hours} \\ &= 62.72 \text{ hours} \end{aligned}$$

**Time required for first 14 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$\begin{aligned} y &= 10 \times (14)^{-0.322} \\ \log y &= \log 10 - 0.322 \times \log 14 \\ \log y &= \log 10 - 0.322 \times \log (2 \times 7) \end{aligned}$$

$$\begin{aligned} \log y &= \log 10 - 0.322 \times \log (2 \times 7) \\ \log y &= \log 10 - 0.322 \times [\log 2 + \log 7] \\ \log y &= 1 - 0.322 \times [0.3010 + 0.8451] \\ \log y &= 0.63096 \\ y &= \text{antilog of } 0.63096 \\ y &= 4.275 \text{ hrs} \end{aligned}$$

$$\begin{aligned} \text{Total time for 14 units} &= 14 \text{ units} \times 4.275 \text{ hrs} \\ &= 59.85 \text{ hrs} \end{aligned}$$

**Time required for 25 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$\begin{aligned} \text{Total time for first 15 units} &= 62.72 \text{ hrs} \\ \text{Total time for next 10 units} &= 28.70 \text{ hrs} [(62.72 - 59.85) \text{ hours} \times 10 \text{ units}] \\ \text{Total time for 25 units} &= 62.72 \text{ hrs} + 28.70 \text{ hrs} \\ &= 91.42 \text{ hrs} \end{aligned}$$

### W.N.2

#### Computation of Standard and Actual Rate

$$\text{Standard Rate} = \frac{\text{₹ } 1,19,288}{180.74 \text{ hrs}}$$

$$= \text{₹ } 660.00 \text{ per hr.}$$

$$\begin{aligned} \text{Actual Rate} &= \frac{\text{₹ } 79,704}{118.08 \text{ hrs}} \\ &= \text{₹ } 675.00 \text{ per hr.} \end{aligned}$$

### W.N.3

#### Computation of Variances

$$\begin{aligned} \text{Labour Rate Variance} &= \text{Actual Hrs} \times (\text{Std. Rate} - \text{Actual Rate}) \\ &= 118.08 \text{ hrs} \times (\text{₹ } 660.00 - \text{₹ } 675.00) \\ &= \text{₹ } 1,771.20 \text{ (A)} \end{aligned}$$

$$\begin{aligned} \text{Labour Efficiency Variance} &= \text{Std. Rate} \times (\text{Std. Hrs} - \text{Actual Hrs}) \\ &= \text{₹ } 660 \times (91.42 \text{ hrs} - 118.08 \text{ hrs}) \\ &= \text{₹ } 17,595.60 \text{ (A)} \end{aligned}$$

**Statement of Reconciliation (Actual Figures Vs Budgeted Figures)**

Particulars	
Actual Cost	79,704.00
Less: Labour Rate Variance (Adverse)	1,771.20
Less: Labour Efficiency Variance (Adverse)	17,595.60
Budgeted Labour Cost (Revised)*	60,337.20

Budgeted Labour Cost (Revised)\*

$$= \text{Std. Hrs.} \times \text{Std. Rate}$$

$$= 91.42 \text{ hrs.} \times `660$$

$$= ` 60,337.20$$

**(8 marks)**

**(B)**

**Analysis of WIP Account**

	November	December
Opening WIP	36,000	<b>56,600</b>
<b>Add</b> : Direct Materials Usage	50,000	56,000
<b>Add</b> : Direct Labor	53,100	69,000
<b>Add</b> : Variable Overhead	25,000	29,000
Total Inflow into WIP	1,64,100	2,10,600
<b>Less</b> : Variable Cost of Goods Manufactured	1,07,500	1,15,900
Ending WIP	<b>56,600</b>	<b>94,700</b>

**(3 marks)**

**Analysis of Finished Goods Inventory Account**

	November	December
Opening Finished Goods	44,000	<b>28,500</b>
<b>Add</b> : Cost of Goods Manufactured	1,07,500	1,15,900
Cost of Goods Available for Sale	1,51,500	1,44,400
<b>Less</b> : Cost of Goods Sold	1,23,000	<b>99,400</b>
Ending Finished Goods Inventory	28,500	45,000

**(3 marks)**

**(C)**

Advantages of "Target Costing are as under:

- (i) Target costing ensures **proper planning well ahead of actual production** and marketing.
- (ii) Implementation of Target Costing **enhances employee awareness and empowerment.**
- (iii) Foster **partnership with suppliers.**
- (iv) **Minimize** non value-added activities.

(v) Encourages selection of **lowest cost** value added activities.

(Students can write any four points)

(2 marks)

Answer 5:

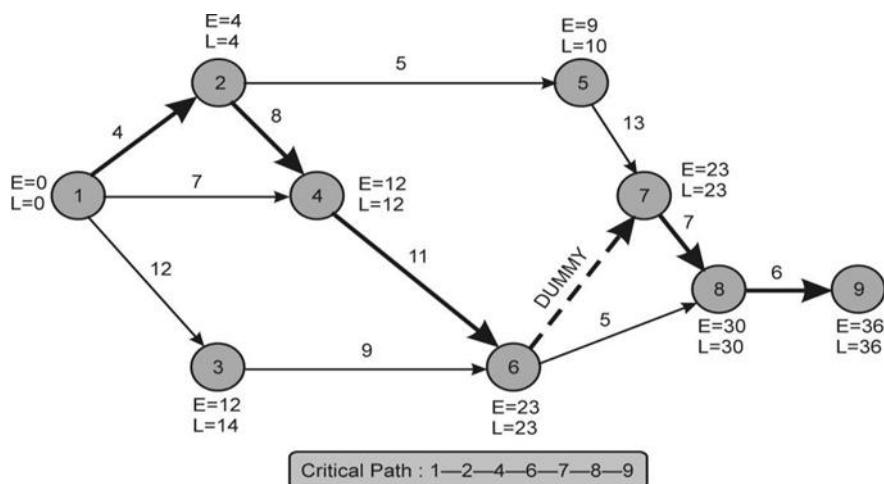
(A)

1. Calculation of **Missing Figures**:

Activity	Duration	EST	EFT	LST	LFT	Total Float
	Dij	Ei	Ei + Dij	Lj - Dij	Lj	LST- EST
1-2	4	0	4	0	4	0
1-3	12	0	12	2	14	2
1-4	7	0	7	5	12	5
2-4	8	4	12	4	12	0
2-5	5	4	9	5	10	1
3-6	9	12	21	14	23	2
4-6	11	12	23	12	23	0
5-7	13	9	22	10	23	1
6-7	0	23	23	23	23	0
6-8	5	23	28	25	30	2
7-8	7	23	30	23	30	0
8-9	6	30	36	30	36	0

(5 marks)

2. The **Network** for the given problem



(2 marks)

3. The **Various Paths** in the Network are:

1-2-4-6-7-8-9 with Duration 36 Days

1-2-5-7-8-9 with Duration 35 Days

1-3-6-7-8-9 with Duration 34 Days

1-2-4-6-8-9 with Duration 34 Days

1-3-6-8-9 with Duration 32 Days

1-4-6-7-8-9 with Duration 31 Days

1-4-6-8-9 with Duration 29 Days

**(2 marks)**

4. The **Critical Path** is 1-2-4-6-7-8-9 with Duration 36 Days.

**(1 mark)**

**(B)**

- (i) Machine A is being used to the full capacity because, corresponding slack variable  $s_1$  has a zero value in the solution.
- (ii)  $C_j - Z_j$  for  $x_1$  being -1, production of each unit of  $x_1$  would cause a reduction of 1 rupee. Thus, the price for  $x_1$  should be increased by at least 1 rupee to ensure no reduction of profits.
- (iii) When 2 hours are lost (due to repairs), then production of  $x_2$  would decrease by 2 units and the total profit decrease by Rs. 10.
- (iv) The shadow price of hours on machine A and machine B are being Rs. 5 and Rs. 0 respectively, these are the maximum prices one would be prepared to pay for another hour of capacity for these two machines. **(1 mark x 4 = 4 marks)**

**(C)**

Primary activities are the activities that are directly involved in transforming inputs into outputs and delivery and after-sales support to output. Following are the primary activities in the value chain of ABC Ltd.:-

- (i) **Inbound Logistics:** These activities are related to the material handling and warehousing. It also covers transporting raw material from the supplier to the place of processing inside the factory.
- (ii) **Operations:** These activities are directly responsible for the transformation of raw material into final product for the delivery to the consumers.
- (iii) **Outbound Logistics:** These activities are involved in movement of finished goods to the point of sales. Order processing and distribution are major part of these activities.
- (iv) **Marketing and Sales:** These activities are performed for demand creation and customer solicitation. Communication, pricing and channel management are major part of these activities.
- (v) **Service:** These activities are performed after selling the goods to the consumers. Installation, repair and parts replacement are some examples of these activities..

(Students can write any two points)

(1 mark x 2 = 2 marks)

Answer 6:

(A)

“Ranking of Products When Availability of Time is the Key Factor”

Products	A	B	C	D
Market Price (Rs.)	150	146	140	130
Less : Variable Cost (Rs.)	130	100	90	85
Contribution per unit (Rs.)	20	46	50	45
Labour Hours Per unit	3 hrs.	4 hrs.	2 hrs.	3 hrs
Contribution per Labour Hour	6.66	11.50	25.00	15.00
Ranking	IV	III	I	II
Maximum Demand (units)	2,800	2,500	2,300	1,600
Total No. of Hours	8,400	10,000	4,600	4,800
Allocation of 20,000 Hours on the Basis of Ranking	600*	10,000	4,600	4,800

(\*) Balancing Figure

(4 marks)

**Note** – Time required to meeting the demand of 2,500 units of Product D for Division Y is 7,500 hrs. This requirement of time viz. 7,500 hrs for providing 2,500 units of Product D for Division Y can be met by sacrificing 600 hours of Product A(200 units) and 6,900 hours of Product B(1,725 units).

$$\begin{aligned}\text{Transfer Price} &= \text{Variable Cost} + \text{Opportunity Cost} \\ &= \text{Rs. } 85 + \frac{(6,900 \text{ hrs.} \times \text{Rs. } 11.5 + 600 \text{ hrs.} \times \text{Rs. } 6.66\dots)}{2,500 \text{ units}} \\ &= \text{Rs. } 85 + \frac{\text{Rs. } 79,350 + \text{Rs. } 4,000}{2,500 \text{ units}} \\ &= \text{Rs. } 85 + \text{Rs. } 33.34 \\ &= \text{Rs. } 118.34\end{aligned}$$

(2 marks)

(B)

### Computation of Requirements of Question

#### Budgeted output in units

Fixed Overhead Expenditure Variance

$$\begin{aligned}&= \text{Budgeted Fixed Overheads} - \text{Actual Fixed Overheads} \\ \rightarrow \text{Rs. } 8,000 \text{ (A)} &= \text{Budgeted Output} \times (\text{Rs. } 6 \times 5 \text{ hrs.}) - \text{Rs. } 1,58,000 \\ \rightarrow \text{Budgeted Output} &= 5,000 \text{ units}\end{aligned}$$

### Number of litres purchased

$$\text{Material Price Variance} = \text{Actual Quantity} \times (\text{Std. Price} - \text{Actual Price})$$

$$\rightarrow \text{Rs. 8,000 (F)} = \text{No. of litres purchased} \times (\text{Rs. 2} - \text{Rs. 1.95})$$

$$\rightarrow \text{No. of litres purchased} = 1,60,000 \text{ litres}$$

### Number of litres used above standard allowed

$$\text{Material Usage Variance} = \text{Standard Price} \times (\text{Standard Quantity} - \text{Actual Quantity})$$

$$\rightarrow \text{Rs. 5,000 (A)} = \text{Rs. 2} \times (\text{Standard Quantity} - 1,60,000 \text{ litres})$$

$$\rightarrow \text{Standard Quantity} = 1,57,500 \text{ litres}$$

$$\text{No. of litres above Standard} = 1,60,000 \text{ litres} - 1,57,500 \text{ litres}$$

$$= 2,500 \text{ litres}$$

### Actual units Produced

$$\text{Labour Cost Variance} = \text{Rate Variance} + \text{Efficiency Variance}$$

$$= \text{Rs. 5,760 (A)} + \text{Rs. 2,760 (F)}$$

$$= \text{Rs. 3,000 (A)}$$

$$\text{Labour Cost Variance} = \text{Standard Cost} - \text{Actual Cost}$$

$$\rightarrow \text{Rs. 3,000 (A)} = \text{Actual Output} \times (\text{Rs. 6} \times 5 \text{ hrs.}) - \text{Rs. 1,56,000}$$

$$\rightarrow \text{Actual Output} = 5,100 \text{ units}$$

### Actual hours worked

$$\text{Labour Efficiency Variance} = \text{Standard Rate} \times (\text{Standard Hours} - \text{Actual Hours})$$

$$\rightarrow \text{Rs. 2,760 (F)} = \text{Rs. 6} \times (5,100 \text{ units} \times 5 \text{ hrs.} - \text{Actual Hours})$$

$$\rightarrow \text{Actual Hours} = 25,040 \text{ hours}$$

### Average actual wage rate per hour

$$\text{Labour Rate Variance} = \text{Actual Hours} \times (\text{Standard Rate} - \text{Actual Rate})$$

$$\rightarrow \text{Rs. 5,760 (A)} = 25,040 \text{ hours} \times (\text{Rs. 6} - \text{Actual Rate})$$

$$\rightarrow \text{Actual Rate} = \text{Rs. 6.23 ... per hour}$$

**(6 marks)**

### (C)

The balanced scorecard is a method which displays organisation's performance into four dimensions namely financial, customer, internal and innovation. The four dimensions acknowledge the interest of shareholders, customers and employees taking into account of both long-term and short-term goals. The detailed analysis of performance of the company using Balance Scorecard approach as follows:

- (i) **Financial Perspective:** Operating ratio and average revenue will be covered in this prospective.

Company is unable to achieve its target of reducing operating ratio to 50% instead it has increased to 60%. Company is required to take appropriate steps to control and manage its operating expenses. Average revenue per user has increased from Rs. 210 to Rs. 225 but remains short of targeted Rs. 250. This is also one of the reasons of swelled operating ratio. Company can boost up its average revenue per user either by increasing the price of its services or by providing more paid value added services.

(ii) **Customer Perspective:** Service complaints will be covered under this perspective. The company had set a target of reducing unresolved complaints by 20% instead unresolved complaints have risen by 10%  $[(27,500-25,000)/(25,000) \times 100]$ . It shows dissatisfaction is increasing among the consumers which would adversely impact the consumer's general perception about the company and company may lose its consumers in long run.

(iii) **Internal Business Perspective:** Establishing customer relationship centres will be covered under this perspective. Company has established 80 relationship centres in the current period exceeding its target of 50 (250-200) to cater to the needs of existing consumers as well as soliciting new consumers. This shows the seriousness of the company towards the consumer satisfaction and would help them in the long run.

(iv) **Learning and Growth Perspective:** Employee training programmes are covered under this perspective.

Company had set a target to cover at least 15% employee under its training programmes but covered only 10%. This could hurt capabilities of the employees which are needed for long term growth of the organisation necessary to achieve the objectives set in the previous three perspectives. People or the Indraprastha resource of the company is one of the three principle sources where organisational learning and growth comes. **(1 mark x4 = 4 marks)**

**Answer 7:**

**(A)**

The assignment problem is special case of transportation problem; it can also be solved by transportation method. But the solution obtained by applying this method would be severely degenerate. This is because the optimality test in the transportation method requires that there must be  $m+n-1$  allocations/assignments. But due to the special structure of assignment problem of order  $n \times n$ , any solution cannot have more than  $n$  assignments. Thus, the assignment problem is naturally degenerate. In order to remove degeneracy,  $n-1$ \* number of dummy allocations will be required in order to proceed with the transportation method. Thus, the problem of degeneracy at each solution makes the transportation method computationally inefficient for solving an assignment problem.

$$(*) \underline{m+n-1} - \Leftrightarrow \underline{n+n-1} - n \Leftrightarrow \underline{2n-1} - n \Leftrightarrow \underline{n-1}$$

**(4 marks)**

**(B)**

The main objectives of Uniform Costing are as follows:

(i) **Facilitates Comparison:** To facilitate the comparison of costs and performances of different units in the same industry; it provides objective basis.



- (ii) **Eliminates Unhealthy Competition:** To eliminate unhealthy competition among the different units of an industry.
- (iii) **Improves Efficiency:** To improve production capacity level and labour efficiency by comparing the production costs of different units with each other.
- (iv) **Provides Relevant Data:** To provide relevant cost information/ data to the Government for fixing and regulating prices of the products.
- (v) **Ensures Standardisation:** To bring standardisation and uniformity in the operation of participating units.
- (vi) **Reduces Cost:** To reduce production, administration, selling and distribution costs, and to exercise control on fixed costs.

(Students can write any four points)

(1 mark x 4 = 4 marks)

(C)

(i) The Initial basic solution worked out by the shipping clerk is as follows-

Warehouse	Market				Supply
	I	II	III	IV	
A	5	2 <span style="border: 1px solid black; padding: 2px;">12</span>	4 <span style="border: 1px solid black; padding: 2px;">1</span>	3 <span style="border: 1px solid black; padding: 2px;">9</span>	22
B	4	8	1 <span style="border: 1px solid black; padding: 2px;">15</span>	6	15
C	4 <span style="border: 1px solid black; padding: 2px;">7</span>	6	7 <span style="border: 1px solid black; padding: 2px;">1</span>	5	8
Req.	7	12	17	9	45

The initial solution is tested for optimality. The total number of independent allocations is 6 which is equal to the desired  $(m + n - 1)$  allocations. We introduce  $u_i$ 's ( $i = 1, 2, 3$ ) and  $v_j$ 's ( $j = 1, 2, 3, 4$ ). Let us assume  $u_1 = 0$ , remaining  $u_i$ 's and  $v_j$ 's are calculated as below-

$(u_i + v_j)$  Matrix for Allocated / Unallocated Cells

				$u_i$	
	1	2	4	3	0
	-2	-1	1	0	-3
	4	5	7	6	3
$v_j$	1	2	4	3	

Now we calculate  $\Delta_{ij} = C_{ij} - (u_i + v_j)$  for non basic cells which are given in the table below-

$\Delta_{ij}$  Matrix

4			
6	9		6
	1		-1

Since one of the  $\Delta_{ij}$ 's is negative, the schedule worked out by the clerk is not the optimal solution.

- (ii) Introduce in the cell with negative  $\Delta_{ij}$  [ $R_3C_4$ ], an assignment. The reallocation is done as follows-

	12	1	9
		+1	-1
		15	
7		1	
		-1	+1

(4 marks)

**Revised Allocation Table**

	12	2	8
		15	
7			1

Now we test the above improved initial solution for optimality-

**( $u_i + v_j$ ) Matrix for Allocated / Unallocated Cells**

				$u_i$	
	2	2	4	3	0
	-1	-1	1	0	-3
	4	4	6	5	2
$v_j$	2	2	4	3	

**$\Delta_{ij}$  Matrix**

3			
5	9		6
	2	1	

Since all  $\Delta_{ij}$  for non basic cells are positive, the solution as calculated in the above table is the optimal solution. The supply of units from each warehouse to markets, along with the transportation cost is given below-

Warehouse	Market	Units	Cost per unit (₹)	Total Cost (₹)
A	II	12	2	24
A	III	2	4	8
A	IV	8	3	24
B	III	15	1	15
C	I	7	4	28
C	IV	1	5	5
Minimum Total Shipping Cost				104

(D)

(i) **Invalid**

Kaizen costing is the system of cost reduction procedures which involves making small and continuous improvements to the production processes rather than innovations or large-scale investment.

(ii) **Valid**

The training of employees is very much a long-term and ongoing process in the Kaizen costing approach. Training enhances the abilities of employees.

**(iii) Invalid**

Kaizen Costing approach involves everyone from top management level to the shop floor employees. Every employee's active participation is a must requirement.

**(iv) Invalid**

Though the aim of Kaizen Costing is to reduce the cost but at the same time it also aims to maintain the quality. Kaizen costing also aims to bring the clarity in roles and responsibilities for all employees.