PAPER – 16 : STRATEGIC COST MANAGEMENT

SUGGESTED ANSWERS

SECTION-A

1.

(i) (C)

(ii) (C)

(iii) (C)

(iv) (C)

(v) (D)

(vi) (D)

(vii) (A)

(viii) (B)

(ix) (A)

(x) (B)

(xi) (C)

(xii) (B)

(xiii) (C)

(xiv) (D)

(xv) (A)

SECTION– B

2.

Segregation of Variable Costs and Fixed Costs:

		Cost/per unit (₹)	Variable Cost (₹/ unit)	Fixed Cost (₹)
Direct Material		30.00	30.00	-
Component EX		9.40	7.20	3,96,000
Direct Wages		28.00	28.00	-
Factory Overhead	50% fixed	24.00	12.00	21,60,000
Selling & Distribution Overhead	75% variable	16.00	12.00	7,20,000
Administration Overhead	Fixed	5.00	0.00	9,00,000
Total		112.40	89.20	41,76,000

(i) Statement showing Profitability as envisaged in the Budget:

Units sold	1,80,000
	Amount (₹)
Selling Price per unit	130.00
Less: Variable cost per unit	89.20
Contribution per unit	40.80
Total Contribution	73,44,000
Less: Fixed Cost	41,76,000
Profit	31,68,000

Alternative Solution:

Statement showing Profitability as envisaged in the Budget:

	₹('000s)	₹ ('000s)
Sales		23400
Direct Material	5400	
Component "EX"	1296	
Direct wages	5040	
Variable factory overheads	2160	
Variable selling & distribution overheads	2160	
Total variable cost		16056
Contribution		7344
Fixed factory overheads	2160	
Fixed selling & distribution overheads	720	
Component "EX"	396	
Administrative overhead	900	
Total Fixed Cost		4176
Profit		3168

(ii) Evaluation of Export Order:

	₹ per Unit	₹ per Unit
Direct material	56	
Direct labour	70	
Variable factory overhead	30	
Selling and distribution overheads	14	
Total variable cost		170
Selling price (export)		175
Contribution		5
Total units		6000
Additional contribution from export order (6000 units X ₹5)		₹ 30,000

Verification of availability of Capacity to fulfill the export order:

Total labour Hours on Product 50 grade	7,20,000
Total labour Hours on component EX	90,000
Total hours utilised at 90% capacity	8,10,000
Total Hours at 100% capacity	9,00,000
Balance Hours available	90,000
Hours required for export order	60,000

Decision:

Since export order gives an additional contribution of ₹30,000 and availability of capacity also exists to fulfill the export order, the same is acceptable.

(iii) Appraisal of Make or Buy Decision:

(per 15000 units)	Make (₹)	Buy (₹)
Direct material	30,000	
Direct labour	52,500	
Variable factory overhead	25,500	
Total	1,08,000	1,18,500
Per unit	7.20	7.90

Decision:

If the company makes the component, the out-of-pocket cost is ₹ 7.20 per unit whereas if the component is bought, the out-of-pocket cost is ₹ 7.90. Since no alternative use of spare capacity is available, it is profitable to make.

3. (a)

(i) Comparative Profitability Statement of Division M (figures in ₹):

Particulars	Alternative Situations		
	Sales at ₹ 25	Transfer at ₹ 22	Do not transfer
Sales Revenue: Market Sales	12,50,000	12,50,000	12,50,000
Transfer to Division	2,50,000	2,20,000	
Total (A)	15,00,000	14,70,000	12,50,000
Variable Cost (at ₹ 15 / unit)	9,00,000	9,00,000	7,50,000
Fixed Cost	3,00,000	3,00,000	2,60,000
Total (B) (₹)	12,00,000	12,00,000	10,10,000
Total Profit (A – B) (₹)	3,00,000	2,70,000	2,40,000
Total Assets (₹)	12,00,000	12,00,000	10,00,000
ROI	25.00%	22.50%	24.00%

Decision:

Manager of Division M should not transfer the product at ₹ 22 / unit to Division N because it is less than its selling price i.e. ₹ 25 / unit and will get low rate of return at ₹ 22/unit by 2.5% (25% - 22.50%).

(ii) Calculation of lowest transfer price:

The lowest transfer price acceptable to Division M is one, which maintains its rate of return of 24% without selling to Division N

= (Total Sales Revenue – Total Cost) / Total Assets = 0.24.

Or, [(₹ 12,50,000 + 10,000 x Transfer Price (TP)] – 12,00,000] ÷ ₹ 12,00,000 = 0.24

Or, 10,000 TP = 2,88,000 – 50,000 = 2,38,000

Or, TP = 2,38,000 ÷ 10,000 = 23.80 i.e.₹ 23.80

The lowest transfer price acceptable to Division – M is ₹ 23.80 per unit.

3.(b)

(i) Calculation of Break-Even Quantity:

	Amount (₹)
Selling Price per unit	200
Variable Cost per unit	120
Contribution per unit	80
Total Fixed Costs	20,00,000
Break Even Quantity	25,000

(ii)

(a) Calculation of No. of units to earn a profit of ₹ 6,00,000:

	Amount (₹)
Total Fixed Costs	20,00,000
Required Profit	6,00,000
Total contribution required	26,00,000
Contribution per unit	80
Units to be sold to earn a profit of ₹ 6,00,000	32,500

(b) Calculation of No. of units to incur a loss of ₹ 5,00,000:

	Amount (₹)
Total Fixed Costs	20,00,000
Required Loss	5,00,000
Total contribution required	15,00,000
Contribution per unit	80
units to be sold to incur loss of ₹5,00,000	18,750

(iii) Calculation of probability that the company will Break-Even:

To calculate the probability that the company will break even, we have to calculate the cumulative probability of Sales Volume equal to or greater than the 25000 units i.e. the break-even volume. Therefore, the required probability is 10 % + 20 % + 30 % + 10 % + 10 % i.e. 80%.

(iv) Calculation of probability of sales volume mentioned at (ii) above:

(a) Required Sales volume = 32,500 units

Cumulative probability of sales volume being greater than 32,500 units is 30 % + 10 % + 10 % i.e. 50%

(b) Required Sales volume = 18,750 units

Cumulative probability of sales volume being less than 18,750 units is 10 %. Further, chances of incurring loss are cumulative probability of sales volume being less than 25,000 units is 10 % + 10 % i.e. 20%.

4. (a)

Absorption of overhead on the basis of Prime Cost

Calculation of Absorption of overhead cost rate

$$= \frac{2250000 + 1730000 + 684500 + 514800}{30139000}$$

Absorption of Overhead Rate = 17.18 %

(For a batch of 15000 units)

(i) Calculation of Cost of Product per unit on the basis of absorption costing method.

Particulars	**Amount (₹)**
Materials	26,38,700.00
Wages	3,75,200.00
Prime Cost	30,13,900.00
Overhead Cost (17.18% of Prime Cost)	5,17,788.02
Cost of Product	35,31,688.02
No. of unit in a batch	15,000 units
Cost of Product Per unit	₹ 235.45

(ii) Statement Showing Cost Driver Rate

Overhead	Cost (₹)	Cost Driver	Cost Driver Rate (₹)
Material Procurement	22,50,000	No. of Purchase Orders = 1,500 Order	1500 per order
Maintenance	17,30,000	Maintenance Hours = 9,080 hours	190.53 per hour
Set up	6,84,500	No. of Setup = 2,250 Setup	304.22 per setup
Quality Control	5,14,800	No. of inspections = 2,710 insp.	189.96 per inspection

(iii) Statement Showing Total Cost and Per unit Cost based on Activity Based Costing :

Particulars	Total Cost (₹)	Per Unit Cost (₹)
Materials	26,38,700.00	175.91
Wages	3,75,200.00	25.01
Prime Cost	30,13,900.00	200.92
Overhead Activity Cost :		
Material Order Cost	72,000.00	4.80
Maintenance Cost	1,54,329.30	10.29
Setup Cost	12,168.80	0.81
Quality control Cost	4,749.00	0.32
Total Cost	32,57,147.10	217.14

4. (b)

The Phases of Value Analysis are summarized as follows:

(1) **Origination:** The phase of origination starts with the identification of a project to undertake value analysis. After selecting the project, a project team consisting of experts from various fields and departments is constituted.

(2) **Information:** The second phase is that of collecting relevant information. In this phase, the relevant facts relating to specifications, drawings, methods, materials, etc. are collected. Costs are, also, ascertained for each of the elements that are being studied.

(3) **Functional Analysis:** Then follows the important phase of functional analysis. After familiarisation with the relevant facts & figures, a functional analysis is carried out to determine the functions and uses of the product and its components. The cost and importance of each function are identified. A value index is computed on the basis of cost benefit ratio for each of the functions

(4) **Innovation:** This is the creative phase concerned with the generation of new alternatives to replace or remove the existing ones. The objective is to produce ideas and to formulate alternative means and methods for accomplishing the essential functions and improving the value of the element under consideration.

(5) **Evaluation:** During the stage of evaluation, each and every alternative is analysed and the most promising alternatives are selected. These alternatives are further examined for economic and technical feasibility. The alternatives finally selected must be capable of performing the desired functions satisfactorily.

(6) **Choice:** In this phase, the decision makers choose the best of alternatives. The programs and action plans are then developed to implement the chosen alternative.

(7) **Implementation:** The chosen alternative is put to the actual use with the help of the programs and action plans. The progress of implementation is continuously monitored and followed up to ensure that the desired results are achieved.

5.

(i) Analysis of Variances:

1. **Direct Material Cost Variances:**

Direct Material Price Variance = 16,500 (₹20 - ₹ $\frac{396000}{16500}$)

= ₹3,30,000 – ₹ 3,96,000 = ₹ 66,000 (A)

Direct Material Usage Variance = ₹ 20 (8,000 X 2 – 16,500) = ₹ 10,000 (A)

2. **Direct Wages Variances:**

Wages Rate Variance = (₹2 - ₹ $\frac{346800}{170000}$) 1,70,000

= ₹3,40,000 – ₹ 3,46,800 = ₹ 6,800 (A)

Wages Efficiency Variance = ₹ 2 (8,000 X 20 – 1,66,000)

= ₹ 2 (1,60,000 – 1,66,000) = ₹ 12,000 (A)

Idle time Variance = 4,000 X ₹ 2 = ₹ 8,000 (A)

3. **Variable Overhead Cost Variance**

Variable Overhead Cost Variance = ₹ 8 x 8,000 – ₹ 60,000 = ₹ 4,000 (F)

Alternatively

VOH Expenditure Variance = ₹ ($\frac{8}{20}$ - $\frac{60,000}{170,000}$) X 1,70,000

= ₹ 68,000 – ₹ 60,000 = ₹ 8,000 (F)

VOH Efficiency Variance = ₹ 0.4(1,60,000 – 1,70,000)

= ₹ 4,000 (A)

4. **Fixed Overhead Cost Variance**

FO Expenditure Variance = ₹ 2,00,000 – ₹ 1,84,000 = ₹ 16,000 (F)

FO Volume Variance = ₹ 20 X 8,000 – ₹ 2,00,000 = ₹ 40,000 (A)

5. **Sales Margin Variances**

Here actual sales margin per unit and standard sales margin per unit remains same i.e. actual price – standard cost = ₹ 140- ₹ 108 = ₹ 3

Sales Margin Price Variance = (₹ 32 - ₹ 32) X 8,000 = NIL

Sales Margin Volume Variance = (8,000-10,000) X ₹ 32 = ₹ 64,000 (A)

(ii) Calculation of Standard Profit

	Per Unit (₹)
Selling Price	140
Less: Variable Cost	88
Contribution	52
Standard Sales Quantity	8000
Total Contribution	4,16,000
Less: Standard Fixed Overhead @ ₹20 per unit	1,60,000
Standard Profit	2,56,000

Reconciliation between Standard Profit& Actual Profit

Standard Profit			₹ 2,56,000
Cost Variances	Adverse (₹)	Favourable (₹)	
Direct Material			
Price Variance	66,000		
Usage Variance	10,000		
Wages			
Rate Variance	6,800		
Idle Time Variance	8,000		
Efficiency Variance	12,000		
Variable Overhead			
Cost Variance		4,000	
Fixed Overhead			
Expenditure Variance		16,000	
Volume Variance	40,000		
	1,42,800	20,000	1,22,800 (A)
Actual Profit			1,33,200

Alternative Solution

(i) Analysis of Variances:

For Material Cost Variances :	₹
M1 – Actual Cost of Material used	3,96,000
M2 – Standard Cost of Material used	3,30,000
M3 – No mix variance	Nil
M4 – Standard material cost Output	3,20,000
Material Price Variance. (M1 – M2)	66,000 (A)
Material Usage Variance. (M2– M4)	10,000 (A)
For Direct Wages Variances :	
L1– Actual payment made to workers for actual hours worked	346800
L2– Payment involved, if workers had been paid at standard rate	340000
L3– No gang variance	
L4– Standard labour cost of labour hours utilised. (This step will have value when there is a difference between hours available and hours utilised.)	3,32,000
L5– Standard labour cost of output achieved	3,20,000
Wage Rate Variance (L1 – L2)	6,800 (A)
Wage idle Time Variance(L2 – L4)	8,000 (A)
Wage Yield Variance(L4 – L5)	12,000 (A)
For Variable Overhead Variances :	
VO1 – Actual variable overhead (given)	60,000
VO2 – No expenditure variance	Nil
VO3– Standard variable overhead for production	64,000
Variable Overhead Variance (VO1 – VO3)	4,000 (F)
For Fixed Overhead Variances :	
FO1 – Actual fixed overhead incurred (given)	1,84,000
FO2 – Budgeted fixed overhead for the period	2,00,000
FO3 –There is no calendar or idle time variance	
FO4 – Fixed overhead for actual hours worked at standard rate	1,66,000
FO5 – Standard fixed overhead for production	1,60,000

Fixed overhead expenditure variance(FO1 – FO2)	16,000 (F)
Fixed overhead idle time variance(FO2 – FO4)	34,000 (A)
Fixed overhead efficiency variance(FO4 – FO5)	6,000 (A)
For Sales Margin Variances :	
Standard sales margin = ₹ 32 (given). Actual sales margin also remains the same i.e., actual price – standard cost.	
SM1– Actual sales margin on actual sales.	2,56,000
SM2– Standard sales margin on actual sales	2,56,000
SM3– No Mix Variances	Nil
SM4– Standard sales margin on standard sales mix or budgeted sales margin as per budget or standard.	3,20,000
Sales Margin Price Variance (SM1 – SM2)	Nil
Sales Margin Volume Variance (SM2 – SM4)	64,000 (A)

ii) Calculation of Standard Profit

	Amount (₹)
Budgeted Profit	3,20,000
Less: Sales Margin Volume Variance (Adverse)	64,000
Standard Profit	2,56,000

Reconciliation between Standard Profit& Actual Profit

Standard Profit			₹2,56,000
Cost Variances	Adverse (₹)	Favourable (₹)	
Direct Material			
Price Variance	66,000		
Usage Variance	10,000		
Wages			
Rate Variance	6,800		
Idle Time Variance	8,000		
Yield Variance	12,000		
Variable Overhead			
Cost Variance		4,000	
Fixed Overhead			
Expenditure Variance		16,000	
Idle Time Variance	34,000		
Efficiency Variance	6,000		
	1,42,800	20,000	1,22,800 (A)
Actual Profit			1,33,200

6. (a)

Reduced matrix after Row subtraction operation:

Table-1

From / To	A	B	C	D	E
A	-	0	12	13	3
B	0	-	10	12	1
C	0	1	-	8	2
D	0	3	8	-	2
E	0	1	11	13	-

Reduced matrix after Column subtraction operation:

Table-2

From / To	A	B	C	D	E
A	-	0	4	5	2
B	0	-	2	4	0
C	0	1	-	0	1
D	0	3	0	-	1
E	0	1	3	5	-

Here minimum number of straight lines to cover all the zeroes = 5 = order of the matrix. So, the solution is optimal. Now, assignments done by following standard rules of Hungarian method is as follows:

From / To	A	B	C	D	E
A	-	[0]	4	5	2
B	0	-	2	4	[0]
C	0	1	-	[0]	1
D	0	3	[0]	-	1
E	[0]	1	3	5	-

As per the solution above, the salesman will travel from A to B, B to E, then E to A. This is not meeting the requirement of travelling through all the cities and finally returning to the starting point. Hence the solution is unacceptable.

Under the circumstances, it is decided to try for the assignment at the cells which are having next higher entry after zero. The next minimum non-zero element in the matrix is 1& 2. So, an assignment is made at cell (5,4) instead of zero assignment at cell (4,3) and at cell (2,3) instead of cell (2,5).The resulting solution will be:

From / To	A	B	C	D	E
A	-	[0]	4	5	2
B	0	-	[2]	4	0
C	0	1	-	[0]	1
D	0	3	0	-	[1]
E	[0]	1	3	5	-

The solution is A → B → C → D →E → A.
The distance travelled will be = 12+16+18+16+12 = 74 km.
There can be another schedule also: A → B → E → C → D → A.
Based on this, distance will be = 12+7+23+18+14 = 74 km.

6. (b)

Allocation of Random No.

Demand	Probability	Cumulative probability	Random number interval
97	0.10	0.10	00-09
98	0.15	0.25	10-24
99	0.20	0.45	25-44
100	0.35	0.80	45-79
102	0.15	0.95	80-94
103	0.05	1.00	95-99

Simulation table for simulated demand, unsatisfied demand and unsold cakes:

TABLE :SIMULATION WORKSHEET						
Day	**Random No**	**Demand**	**No. of cakes produced**	**No. of cakes sold**	**Unsatisfied demand**	**No. of cakes unsold**
1	9	97	100	97	0	3
2	98	103	100	100	3	0
3	64	100	100	100	0	0
4	98	103	100	100	3	0
5	94	102	100	100	2	0
6	1	97	100	97	0	3
7	78	100	100	100	0	0
8	10	98	100	98	0	2
9	15	98	100	98	0	2
10	19	98	100	98	0	2
	Total	996	1,000	988	8	12

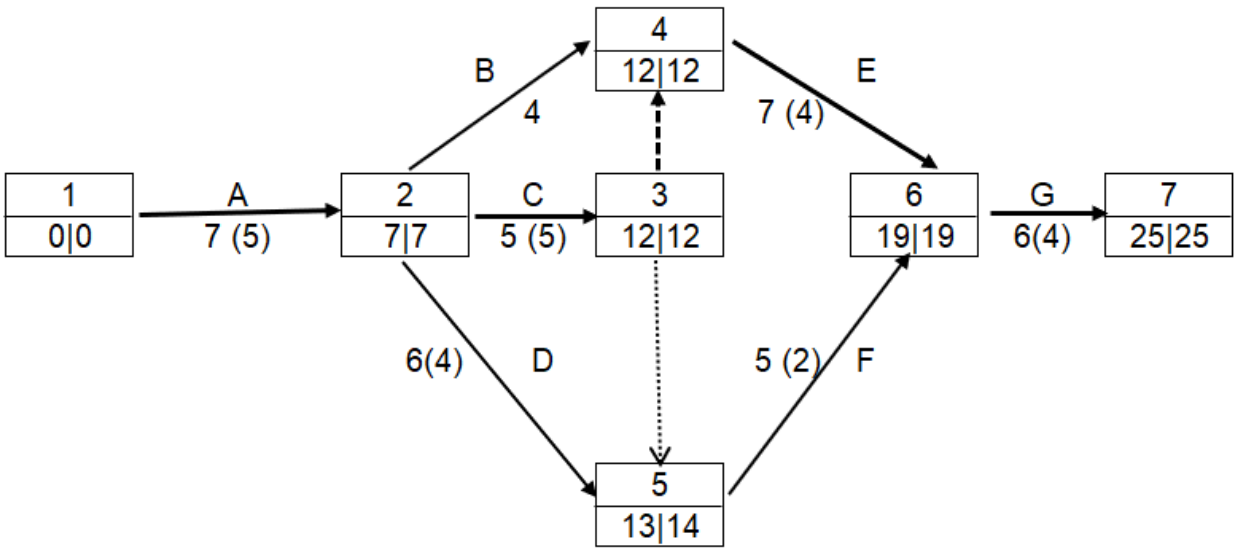
Calculation of Bakery's Profit/Loss

	Number	**Unit rate (₹)**	**Amount (₹)**
Sale of cakes	988	18	17,784
Less: Variable production cost	1,000	14	14,000
Less: Penalty on unsatisfied demand	8	01	8
Less: Penalty on unsold cakes	12	03	36
Profit/Loss			3,740

Thus, the simulated profit for 10 days' operation is ₹ 3,740.

7.

(i) Network Diagram:



Various paths of the network are given below:

1 – 2 – 3 – 4 – 6 – 7 with duration = 25 days
1 – 2 – 4 – 6 – 7 with duration = 24 days
1 – 2 – 3 – 5 – 6 – 7 with duration = 23 days
1 – 2 – 5 – 6 – 7 with duration = 24 days

(ii) The critical path of the project is A $\rightarrow$ C $\rightarrow$ E $\rightarrow$G or 1 – 2 – 3 – 4 – 6 – 7 with normal duration of 25 days.

(iii) Calculation of Cost Slope for various activities:

Activity	Normal duration	Crash duration	Normal Cost (₹)	Crash Cost (₹)	Cost Slope (₹)
A (1 – 2)	7	5	500	900	200
B (2 – 4)	4	5	400	600	-200
C (2 – 3)	5	5	500	500	N.A.
D (2 – 5)	6	4	800	1000	100
E (4 – 6)	7	4	700	1000	100
F (5 – 6)	5	2	800	1400	200
G (6 – 7)	6	4	800	1600	400
		Total	4500		

Step-1:

In order to determine the cost of completing the project in 21 days, let us crash that activity on the critical path which has minimum cost slope. It can be seen that the minimum cost slope of ₹100 corresponds to activity E (4 – 6) and it lies on the critical path. Hence, we crash activity E (4 – 6) by 1 day at an additional cost of ₹ 100.

Step-2:

Various paths now are

1 – 2 – 3 – 4 – 6 – 7 with duration = 24 days
1 – 2 – 4 – 6 – 7 with duration = 23 days
1 – 2 – 3 – 5 – 6 – 7 with duration = 23 days
1 – 2 – 5 – 6 – 7with duration = 24 days

An examination of the above four paths clearly points out that there are two critical paths namely 1 – 2 – 3 – 4 – 6 – 7and 1 – 2 – 5 – 6 – 7, each with duration = 24 days.

To reduce the project duration by three days more, there are following possible combination of activities:

1. Crash activities 4 – 6 on the path 1 – 2 – 3 – 4 – 6 – 7 and 5 – 6on the path 1 – 2 – 5 – 6 – 7 by one day each at an additional cost of ₹ 100 + ₹ 200 = ₹300.
2. Crash activities 4 – 6on path1 – 2 – 3 – 4 – 6 – 7and 2 – 5on path1 – 2 – 5 – 6 – 7 by one day each at an additional cost of ₹ 100 + ₹ 100 = ₹ 200.
3. Crash activity 1 – 2 by one day at an additional cost of ₹ 200.

It can be observed that the additional cost of reducing the project duration by one day in combination 2 as well as combination 3 is ₹ 200. Hence any of these two can be selected for crashing. However, since crashing activity 1 – 2 by 1 day reduces the duration of all the paths by 1 day, we will crash it by 1 day. The project duration becomes 23 days at an additional cost of ₹ 200.

Step-3:

Crash activity 1 – 2 by 1 day further, it would reduce the project duration to 22 days at an additional cost = ₹ 200.

Step-4:

Activity 1 – 2 cannot be crashed further. So, we now select the combination 2 stated above for crashing. Crash activities 4 – 6 and 2 – 5 by one day each at an additional cost of ₹ 100 + ₹ 100 = ₹ 200.

The project duration now becomes equal to 21 days.

Hence, in order to complete the project in 21 days, an additional cost of ₹ 100 + ₹ 200+ ₹ 200 + ₹ 200 = ₹ 700 will be incurred.

The normal cost of completing the project in 25 days = ₹ 4500.

Hence, the percentage increase in cost to complete the project in $21 \text{ days} = \frac{\text{Rs } 700}{\text{Rs } 4500} \text{ x } 100 = 15.55\%$

8. (a)

Clearly, the first column is dominated by the second column as all the elements of the first column are greater than elements of second column. Thus eliminating first column, we get

		FIRM Q	
		Medium Advertising	**Heavy Advertising**
FIRM P	No Advertising	5	−2
	Medium Advertising	12	15
	Heavy Advertising	14	10

Again, first row is dominated by second and third row as all the elements of first row are less than the respective elements of second and third row. Hence eliminating first row, we obtain the following 2 x 2 pay-off matrix.

		FIRM Q	
		Medium Advertising	Heavy Advertising
FIRM P	Medium Advertising	12	15
	Heavy Advertising	14	10

As the pay-off matrix does not possess any saddle point, the firms will use mixed strategies. The optimum mixed strategy for firm P is determined by:

$$p_i = \frac{10-14}{12+10-(14+15)} = \frac{4}{7} \quad \text{and} \quad p_2 = 1 - p_i = \frac{3}{7}$$

and for the firm Q is given by:

$$q_i = \frac{10-15}{12+10-(14+15)} = \frac{5}{7} \quad \text{and} \quad q_2 = 1 - q_i = \frac{2}{7}$$

Hence the optimum strategies for the two firms are:

	No Advertising	Medium Advertising	Heavy Advertising
$S_A =$	0	4 / 7	3 / 7

	No Advertising	Medium Advertising	Heavy Advertising
$S_B =$	0	5 / 7	2 / 7

The Value of the game (corresponding to the above strategies) is given by:

$$\mathbf{V} = \frac{12\,x\,10 - 14\,x\,15}{12+10-(14+15)} = \frac{90}{7}$$

Therefore, the Value of the game is v = 90 / 7

8. (b)

Since, in the Trend equation: Y = 25 + 0.6 t

1st Quarter of 2020 is origin, we have t – 0 for 1st Quarter, Further, since time unit is one Quarter, we have t = 1, 2 and 3 for 2nd, 3rd, 4th Quarters respectively of the year 2020.

Hence, the value of t for 1st, 2nd, 3rd and 4th Quarters of 2024 are16, 17, 18 and 19 respectively

The estimated quarterly Sales for the year 2024 are obtained in the following table.

QUARTERLY SALES FOR THE YEAR 2024

Year Quarter 2024	**t**	**Total value (T)**	**Seasonal Effects (S) Seasonal Index ÷ 100**	**Expected Sales (₹ in Lakh) (T x S)**
I.	16	34.6	0.90	31.14
II.	17	35.2	0.95	33.44
III.	18	35.8	1.05	37.59
IV.	19	36.4	1.10	40.04