Time Allowed: 3 Hours   **Full Marks: 100**

The figures in the margin on the right side indicate full marks.

SECTION – A (Compulsory)

1. **Choose the correct option:**   **[15 x 2=30]**

   (i) A company has a choice among three products A, B and C for which the following estimates are available:

   Estimated profits based on demand forecast (₹'000)

	Market X	Market Y
Product A	250	190
Product B	160	220
Product C	200	210

   Probabilities are: X = 0.7 Y = 0.3

   Which Product should be undertaken by the company?

   A) Product A

   B) Product B

   C) Product C

   D) All Three are same

   (ii) The break-even point of a manufacturing company is ₹1,60,000. Fixed cost is ₹ 48,000. Variable cost is ₹12 per unit. The PV ratio will be:

   A) 10%

   B) 20%

   C) 30%

   D) 40%

   (iii) A company has a breakeven point when sales are ` 3,20,000 and variable cost at that level of sales are ` 2,00,000. How much would p/v ratio increase or decrease if variable expenses are dropped by ` 30,000?

   A) Increase by 27.5%

   B) Increase by 9.375%

   C) Decrease by 9.375%

   D) Increase by 37.5%

   (iv) A operates an activity-based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year ending 31st March 2025, the company expected to place a total of 2,895 purchase orders at a total cost of ₹1,10,010. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year, which is divided into 13 four-week periods. During the

four-week period ended 30 June 2024, a total of 210 purchase orders were placed at a cost of ₹7,650. The over- recovery of these costs for the four-week period was

A)   ₹ 390
B)   ₹ 370
C)   ₹ 330
D)   ₹ 350

(v)   The information relating to the direct material cost of a company is as follows: Standard price per unit: ₹7.20 Actual quantity purchased in units: 1600 Standard quantity allowed for actual production in units: 1450 Material price variance on purchase (Favourable): ₹480 What is the actual purchase price per unit?

A)   ₹ 6.9
B)   ₹ 6.8
C)   ₹ 7.2
D)   ₹ 5.2

(vi)   A firm is required to procure three items I, II & III from three vendors V1, V2 & V3 respectively. The quoted prices in Rupees are given in the table below. The management policy clearly states that each item should be procured from only one vendor, and each vendor should supply only one item. The minimum total cost of procurement is –

Items	Vendors		
	V1	V2	V3
I	110	120	130
II	115	140	140
III	125	145	165

A)   1 minutes
B)   2 minutes
C)   3 minutes
D)   4 minutes

(vii)   The drive-up window of a fast-food centre was being studied using simulation for a variety of operating characteristics. As part of the study data was collected on Customer Arrivals as given in the following table. Using expected value calculations determine the expected time between customer arrivals.

Inter arrival time (Minutes)	0.5	1.0	2.0	3.0	4.0	5.0	6.0
Probability	0.10	0.25	0.20	0.30	0.05	0.05	0.05

A)   2.35 minutes
B)   2.00 minutes
C)   2.70 minutes
D)   1.65 minutes

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(viii) Anurag Ltd., a manufacturing company has developed a new product and just completed the manufacture of first 16 units of the product. If the first unit took 6 hours to manufacture and the first 16 units together took 62.9856 hours to produce, the Learning Curve (LC) rate would be

A) 80%

B) 85%

C) 90%

D) 95%

(ix) Which of the following statement is incorrect?

A) Microsoft Excel is most popular among all the available spreadsheets.

B) Zoho Analytics is a tool used for Financial Data analysis.

C) Visualisation Tools are the Reporting Tools.

D) None of the above

(x) Four Ps of Total Quality Management

A) Principles, Project, Problem, & Process

B) People, Process, Problem & Preparation

C) Product identification, Product quality, Product utility & Product expectation

D) None of the above

(xi) The higher the actual hours worked,

A) The lower the capacity usage ratio.

B) The higher the capacity usage ratio.

C) The lower the capacity utilization ratio.

D) The higher the capacity utilization ratio

(xii) Which of the following is not suitable for a JIT production system?

A) Batch production

B) Jobbing production

C)   Process production

D) Service production

(xiii) A standard costing system consists of the following key elements

A) Setting standards for each of the operations.

B) Comparing the actual performance with the standard performance.

C) Analysing and reporting variances arising from the difference between actual and standard performance.

D) All of the Above

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(xiv) Which of the following is not a secondary activity of Value Chain?

    A)   Procurement

    B)   Human Resource Development

    C)   Service

    D)   Technology Development

(xv) A company has the capacity of producing 80000 units and presently sells 20000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹10 in selling price the demand is doubled. What should be the target cost if the demand is doubled at full capacity and profit margin on sale is taken at 25%?

    A)   ₹ 75

    B)   ₹ 90

    C)   ₹ 25

    D)   ₹ 60

Q No	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv	xv
Ans	A	C	B	C	A	B	A	B	D	B	D	A	D	C	D

SECTION – B

(Answer any 5 questions out of 7 questions given. Each question carries 14 marks.)

[5 x 14 = 70]

2. Sri Company Ltd. manufactures and sells in a year 20,000 units of a particular product to definite customers at a price of ₹100 per unit. The Firm has a capacity to produce 25,000 units of the product per annum. To produce beyond 25,000 units per annum, it will have to install a New Equipment at a cost of ₹15 Lakhs. The Equipment will have a life span of 10 years and will have no residual value. There is an offer from a Client to purchase 10,000 units of the product regularly at a price of ₹90 per unit. The order, if accepted, will have to be over and above the existing level of production of 20,000 units.
The Cost Structure of the Product (per unit basis) is Direct Materials - ₹30, Direct Labour- ₹20, Variable Overhead - ₹10 and Profit - ₹20. The present total Fixed Overheads is ₹4,00,000.

During the coming year, it has been estimated that the cost of Direct Material, as compared to the current year will increase by 10%. Because of certain wage agreement Direct Labour Cost will increase by 25%. Fixed OH will increase by 10%. If the new order for 10,000 units is accepted, Fixed Overheads will increase further by ₹60,000 due to increased administrative charges.

Analyse whether the concern should accept the order or instead of that try to secure order for the balance unused capacity, as available now, through some Sales Promotion Expenses which will be ₹50,000 per annum. Ignore financial charges for the new investment.

  [14]

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Answer:

Comparative Profitability Statement

	Alternative I (₹) 20,000 Units	Alternative II (₹) 25,000 Units	Alternative III (₹) 20,000 + 10,000 Units
(i) Sales (20,000 × 100)	20,00,000	25,00,000	29,00,000
(ii) Variable Cost			
Direct Material (₹ 33 per unit)	6,60,000	8,25,000	9,90,000
Direct Labour (₹ 25 per unit)	5,00,000	6,25,000	7,50,000
Variable Overhead (₹ 10 per unit)	2,00,000	2,50,000	3,00,000
	13,60,000	17,00,000	20,40,000
(iii) Contribution [(i) – (ii)]	6,40,000	8,00,000	8,60,000
(iv) Fixed Cost			
Existing 20,000 × 20 = 4,00,000 × 110/100	4,40,000	4,40,000	4,40,000
Increased Administrative charges	--	---	60,000
Sales Promotion Expenses	--	50,000	--
Depreciation on new equipment	--	--	1,50,000
	4,40,000	4,90,000	,50,000
(v) Profit [(iii) – (iv)]	2,00,000	3,10,000	2,10,000

As the profit is higher under Alternative II, the Sri Company Ltd. should increase the sales to 25,000 units to utilize the existing full capacity.

3. (a) **Division A is a profit centre which produces three products X, Y and Z. Each product has an external market. The details are as follows:**

Particulars	X	Y	Z
External market price per unit (₹)	48	46	40
Variable cost of production in division A (₹)	33	24	28
Labour hours required per unit in division A	3	4	2

Product Y can be transferred to Division B, but the maximum quantity that might be required for transfer is 300 units of Y

	X	Y	Z
The maximum external sales are:	800 units	500 units	300 units

Instead of receiving transfers of Product Y from Division A, Division B could buy similar product in the open market at a slightly cheaper price of ₹45 per unit.

Calculate the transfer price be for each unit for 300 units of Y, if the total labour hours available in Division A are:

a.   **3800 hours**

b.   **5600 hours.**   [7]

(b)   **Company X is forced to choose between two machines A and B. The two machines are designed differently but have identical capacity and do exactly the same job. Machine A costs ₹1,50,000 and will last for 3 years. It costs ₹40,000 per year to run. Machine B is an 'economy' model costing only ₹1,00,000, but will last only for 2 years, and costs ₹60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10%.**

Recommend which machine Company X should buy?   [7]

Answer:

(a)   Labour hours requirement to meet potential external demand

= 800 × 3 + 500 x 4 + 300 × 2 = 5000 hours

Contribution per unit

Sl No.	Particulars	X	Y	Z
a	Selling price per unit (₹)	48	46	40
b	Variable cost per unit (₹)	33	24	28
c	Contribution per unit (a - b)	15	22	12
d	Labour hours per unit	3	4	2
e	Contribution per labour hour (₹) (c / d)	5	5,500	6
	Ranking	III	II	I

(i)   **When labour hour is limited to 3800 hours**

First 300 units of Z @ 2 hours = 600 hours

Second 500 units of Y @ 4 hours = 2000 hours

* Third 400 units of X @ 3 hours = 1200 hours

* This is determined from the balance hours

If 300 units of Y has to be transferred to division B then an additional 300 units of Y will have to be produced using 300 x 4 = 1200 hours. Thus no production X will be possible. Transfer price = variable cost of Y = ₹ 24

Since Division A is working at full capacity then there will be an opportunity loss from not being able to meet all the demand.

Opportunity loss = contribution foregone by not producing X = 4 hours x ₹ 5 per hour = ₹ 20.

Since the transfer price should be = ₹ 24 + ₹ 20 = ₹ 44.

(ii)   **When labour hour is limited to 5600 hours**

The maximum time required to all external demand

= 3800 hours as calculated above + 400 x 3 (for the extra A)

5000 hours, leaving a balance of 600 hours to meet internal demand of Y.

With the surplus 600 hours 600/4 = 150 units of Y can be produced within available capacity. The transfer price for this will be just the variable cost @ ₹ 24 per unit. Thus total cost for 150 units is ₹ 3600.

To produce balance of 150 units of Y for internal consumption 600 labour hours will have to be released by curtailing of production of X. And contribution forgone on X = 600 x 5 = ₹ 3000.

Thus the total price for 300 units of Y internal demand

= variable cost of 300 units of Y + Opportunity loss of ₹ 3000 = 10,200

Transfer price per unit = 10200/300 = ₹ 34.

(b) **Statement showing evaluation of Machine A and B**

Particulars	Machine A ₹	Machine B ₹
Cost of purchase	1,50,000	1,00,000
Add: P.V. of running cost for 3 years	99,440	1,04,000
	2,49,440	2,04,100

P.V. of Cash outflow   ₹ 2,49,440   ₹ 2,04,100

2.486   1.735

Equivalent Present value of annual Cash outflow   = ₹1,00,338   = ₹1,17,637

Working Notes:

Compound present value of 3 years @ 10%   = 2.486

P.V. of Running cost of Machine A for 3 years   = ₹ 40,000 x 2.486 = ₹ 99,440

Compound present value of 2 years @ 10%   = 1.735

P.V. of Running cost of Machine B for 2 years   = ₹ 60,000 x 1.735 = ₹ 1, 04,100

Since the annual Cash outflow of Machine B is highest, Machine A can be purchased.

4. (a) **Modern Co produces 3 products, A, B and C, details of which are shown below:**

Particulars	A	B	C
Selling price per unit (₹)	120	110	130
Direct material cost per unit (₹)	60	70	85
Variable overhead (₹)	30	20	15
Maximum demand (units)	30,000	25,000	40,000
Time required on the bottleneck resource (hours per unit)	5	4	3

There are 3,20,000 bottleneck hours available each month.

Calculate the optimum product mix based on the throughput concept   **[7]**

(b) **Discuss the underlying principles of Total quality management.**   **[7]**

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STRATEGIC COST MANAGEMENT

Answer :

(a)

Particulars	A	B	C
Selling price per unit (₹)	120	110	130
Direct material cost per unit (₹)	60	70	85
Throughput per unit (₹)	60	40	45
Time required on the bottleneck resource (hours per unit)	5	4	3
Return per factory hour (₹)	12	10	15
Ranking	2	3	1

Total Available hours = 3,20,000

(-) Hours used for C (40,000 x 3) = 1,20,000

(-) Hours used for A (30,000 x 5) = 1,50,000

= 2,70,000

Balance hours available for B = 50,000

No. of units that can be made in balance hours = 50,000 / 4 = 12,500 units.

Statement showing optimum mix:

	A	B	C
No. of Units	30,000	12,500	40,000

(b) Total Quality Management (TQM) is a comprehensive, organization-wide effort to improve quality in products and services to achieve long-term customer satisfaction. The eight principles of Total Quality Management (TQM) are:

- **Customer focus:** Understanding and meeting customer needs and expectations is the top priority. All activities are aligned to ensure customer satisfaction.

- **Total employee involvement:** All employees, from top management to the frontline, are involved in quality improvement initiatives. This fosters a culture of empowerment and collaboration.

- **Continuous improvement:** Quality improvement is an ongoing process, not a one-time program. Organizations must constantly seek incremental enhancements to processes, products, and services.

- **Process-centered approach:** TQM focuses on managing and improving the processes that create goods and services. This involves mapping, analyzing, and optimizing workflows to ensure consistency and efficiency.

- **System approach to management:** TQM views an organization as an integrated system where all processes and departments work together to achieve quality goals. This requires a strategic and systematic approach to quality management.

- **Continual Improvement:** Embrace a culture of improvement and learning.

- **Fact-based decision-making:** Decisions are based on data, facts, and analysis rather than guesswork. This ensures that improvements are based on reality and not assumptions.

- **Mutually beneficial supplier relationships:** TQM emphasizes building strong, collaborative relationships with suppliers, which helps to improve communication, streamline processes, and reduce defects.

5. (a) A company manufacturing a special type of fencing tile 12" × 8" × 1/2" used a system of standard costing. The standard mix of the compound used for making the tiles is:

1,200 kg. of material A @ ₹0.30 per kg.

500 kg. of Material B @ ₹0.60 per kg

800 kg. of Material C @ ₹0.70 per kg

The compound should produce 12,000 square feet of tiles of 1/2" thickness. During a period in which 1,00,000 tiles of the standard size were produced, the material usage was:

Kg		₹
7,000	Material A @ ₹ 0.32 per kg.	2,240
3,000	Material B @ ₹ 0.65 per kg.	1,950
5,000	Material C @ ₹ 0.75 per kg.	3,750
15,000		7,940

Prepare the cost figures for the period showing Material price, Mixture, Sub-usage Variance. [7]

(b)

Item	Budget	Actual
No. of working days	20	22
Output per man hour	1.0 Units	0.9 Units
Overhead cost	₹ 1,60,000	₹ 1,68,000
Man-hours per day	8,000	8,400

Calculate Overhead Variances. [7]

Answer:

(a)

Area of tile =12" x 8 " = 2/3 sq ft

No of tiles that can be laid in 12000 sq ft is 12000/(2/3) = 18000

		Standard Data			Actual Data		
		Quantity	Price	Value	Quantity	Price	Value
A		6,666.67	0.30	2,000	7,000	0.32	2,240
B		2,777.77	0.60	16,667	3,000	0.65	1,950
C		4,444.44	0.70	3,111	5,000	0.75	3,750
		13,888.89		6,778	15,000		7,940

Q for A = 1200 x 1,00,000/18,000 = 6,666.67

Q for B = 500 x 1,00,000/18,000 = 2,777.77

Q for C = 800 x 1,00,000/18,000 = 4,444.44

	SQSP	RSQSP		AQSP		AQAP
A		7,200 x 0.3	2,160	7,000 x 0.3	2,100	
B		3,000 x 0.6	1,800	3,000 x 0.6	1,800	
C		4,800 x 0.7	3,360	5,000 x 0.7	3,500	
	₹ 6,778		₹ 7,320		₹ 7,400	₹ 7,940

- RSQ for A = (15000/13888.89) x 666667

- Material sub usage variance = ₹ 542(A)

- Material mix variance = ₹ 80(A)

- Material usage variance = ₹ 622(A)

- Material price variance = ₹ 540(A)

- Material cost variance = ₹ 1162(A)

(b)

(1) SRSH (₹)	(2) SRAH (₹)	(3) SRRBH (₹)	(4) SRBH (₹)	(5) ARAH (₹)
1 x 166320	1 x 184800	1 x 176000	₹ 160000	₹ 168000
₹ 166320	₹ 184800	₹ 176000		

Working Notes:

SR = budgeted FOH/budgeted hours = 1,60,000/1,60,000 = 1

RBH = (22/20) x 1,60,000 = 1,76,000

AH = 22 x 8,400 = 1,84,800

AQ = 1,84,800 x 0.9 = 1,66,320

SH = 1,66,320/1 = 1,66,320

(i)   SRSH = Standard Cost of Standard Fixed overheads = ₹ 1,66,320

(ii)   SRAH = Standard Cost of Actual Fixed overheads (or) Fixed overheads Absorbed or Recovered = ₹ 1,84,800

(iii)   SRRBH = Revised Budgeted Fixed overheads = ₹ 1,76,000

(iv)   SRBH = Budgeted Fixed overheads = ₹ 1,60,000

(v)   ARAH = Actual Fixed overheads = ₹ 1,68,000

     a.   FOH efficiency Variance = 1-2 = ₹ 18,480(A)

     b.   FOH Capacity Variance = 2-3 = ₹ 8,800(F

     c.   FOH Calendar Variance = 3-4 = ₹ 16,000(F)

     d.   FOH Volume Variance = 1-4 = ₹ 6,320(F)

     e.   FOH Budget Variance = 4-5 = ₹ 8,000(A)

     f.   FOH Cost Variance = 1-5 = ₹ 1,680(A)

6. (a) A company possesses two manufacturing plants each of which can produce three products x, Y and Z from a common raw material. However, the proportions in which the products are produced are different in each plant and so are the plant's operating costs per hour. Data on production per hour costs are given below, together with current orders in hand for each product.

	Product			Operating cost/ hour in ₹
	X	Y	Z	
Plant A	2	4	3	9
Plant B	4	3	2	10
Orders on hand	50	24	60	

Develop a LPP to minimise the cost   [7]

(b) The manager of a book store has to decide the number of copies of a particular tax law book to order. A book costs ₹ 60 and is sold for ₹ 80. Since some of the tax laws change year after year, any copies unsold while the edition is current must be sold for ₹ 30. From past records, the distribution of demand for this book has been obtained as follows:

Demand (No of copies)	15	16	17	18	19	20	21	22
Proportion	0.05	0.08	0.20	0.45	0.10	0.07	0.03	0.02

Using the following sequence of random numbers, generate the demand for 20 time periods (years). Calculate the average profit obtainable under each of the courses of action open to the manager. Recommend the optimal policy.

14	02	93	99	18	71	37	30	12	10
88	13	00	57	69	32	18	08	92	73

[7]

Answer:

(a)

Let α be the no. of hours of plant A in use.

Let β be the no. of hours of plant B in use.

Objective Function: Min $Z = 9a + 10\beta$

Subject to constraints:

$2\alpha + 4\beta \geq 50$

$4\alpha + 3\beta \geq 24$

$3a + 2\beta \geq 60$

$\alpha, \beta \geq 0$ (Non-negativity factor)

(b)

Random No. Range Table			
Demand	Probability	Cumulative Probability	Random Range
15	0.05	0.05	00-04
16	0.08	0.13	05-12
17	0.20	0.33	13-32
18	0.45	0.78	33-77
19	0.10	0.88	78-87
20	0.07	0.95	88-94
21	0.03	0.98	95-97
22	0.02	1.00	98-99
	1.00		

Calculation of demand and profit for next 20 years					
Year	Random Numbers	Expected demand	No. of books unsold if stock is		
			16	17	18
1	14	17	-	-	1
2	02	15	1	2	3
3	93	20	-	-	-
4	99	22	-	-	-
5	18	17	-	-	1
6	71	18	-	-	-
7	37	18	-	-	-
8	30	17	-	-	1
9	12	16	-	1	2
10	10	16	-	1	2
11	88	20	-	-	-
12	13	17	-		1
13	00	15	1	2	3
14	57	18	-	-	-
15	69	18	-	-	-
16	32	17	-	-	1
17	18	17	-	-	1
18	08	16	-	1	2
19	92	20	-	-	-
20	73	18	-	-	-
			2	7	18

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STRATEGIC COST MANAGEMENT

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Statement Showing Computation of Profit			
No. of Books order	**No. of Books sold**	**Profit**	**Average Profit**
15	15 x 20 = 300	₹ 6000	₹ 300.00
16	16 x 20 - 2 = 318	₹ 6300 (318 x 20) - 2 x 30	₹ 315.00
17	(17 x 20) - 7 = 333	₹ 6450 (333 x 20) - 7 x 30	₹ 322.50
18	(18 x 20) – 18 = 342	₹ 6300 (342 x 20) - 18 x 30	₹ 315.00

7. (a) **Draw a network from the following activities. Evaluate the critical path and total duration of the project.**

Activity	Immediate predecessor activity	Duration (days)
A	—	**10**
B	**A**	**5**
C	**A**	**4**
D	**A**	**7**
E	**B,C**	**6**
F	**C,D**	**4**
G	**E,F**	**7**

[7]

(b) **The usual Learning Curve model is $Y = ax^b$ where**

Y is the average time per unit for x units and 'a' is the time for first unit x is the cumulative number of units

b is the learning coefficient and is equal to (log 0.8)/(log 2) = – 0.322 for a learning rate of 80%

Given that a = 10 hours, you are required to Calculate:

(i) **The average time for 20 units.**

(ii) **The total time for 30 units.**

(iii) **The time for units 31 to 40.**

Given that log 2 = 0.301, Antilog of 0.5811 = 3.812

log 3 = 0.4771, Antilog of 0.5244 = 3.345.

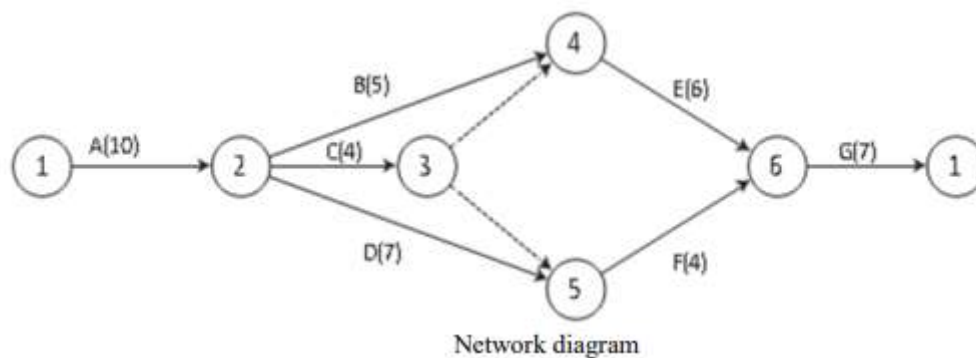**log 4 = 0.6021, Antilog of 0.4841 = 3.049.**

[7]

Answer:

(a) The network is drawn as follows:

Network diagram

Various paths Duration of paths (days)

(i)   1-2-4-6-7 $10 + 5 + 6 + 7 = 28$

(ii)   1-2-3-4-6-7 $10 + 4 + 0 + 6 + 7 = 27$

(iii)   1-2-3-5-6-7 $10 + 4 + 0 + 4 + 7 = 25$

(iv)   1-2-5-6-7 $10 + 7 + 4 + 7 = 28$

Critical paths are 1 - 2 - 4 - 6 - 7 and 1-2-5-6-7 with duration of 28 days and are marked with double lines

(b)

(i) $Y = aX^b$

$Y = 10(20)^{-0.322}$

Taking logarithm on both sides Log Y $= \log 10 + \log 20^{(-0.322)}$ Log Y

$= \log 10 - (0.322) \log 20$

$= 1 - (0.322) \log 20$

$= 1 - (0.322) \times (1.3010)$

$= 1 - 0.41892 = 0.5811$

Log Y $= 0.5811$

Y = Anti log $(0.5811) = 3.812$ hrs (average time for 20 units)

(ii)   Log Y $= \log 10 + \log 30^{(-0.322)}$ Log Y $= 1 - (0.322) \times (1.4771)$

$= 1 - (0.4756)$

$= 0.5244$

Y = anti log $(0.5244) = 3.345$ hrs (average time for 30 units)

Total time for 30 units $= 3.345 \times 30 = 100.35$ hrs

(iii)   Log Y $= \log 10 + \log 40^{(-0.322)}$

$= 1 - (0.322) \times (1.6021)$ Log Y $= 0.4841$

Y = anti log (0.4841) = 3.049 hrs

Total time for 40 units = 40 × 3.049 = 121.96 hrs

Time from 31 to 40 units = 121.96 – (100.35) = 21.61 hrs

8.   (a)   **The demand (rides per day) of Roller Coaster Ride in an Entertainment Park in one of the metro cities is given the equation q = - 450p + 41500, where p = Price per ride in rupees. Suggest what price should have been charged to maximize the total revenue?**   **[7]**

     (b)   **From the following past data of Sales (in lakhs ₹) of a company estimate the same for the year 2025.**

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sales	15.3	14.6	16.8	17.3	17.2	20.9	22.3	20	23.1	24.5

     Assume the trend line to be linear. Calculate the monthly rate of increase of Sales.   **[7]**

Answer:

(a)

Total Revenue is algebraically expressed as a function of price as follows

R(p) = Price per ride × Demand

Or, R(p) = p × q

Or, R(p) = p(- 450p + 41,500)

Or, R(p) = 41500p – 450p^2

Differentiating both sides with respect to 'p' we get

d/dp[R(p)] = 41500 – 900p------------(i)

As per the necessary condition of optimization, d/dp, [R(p)] = 0

Or, 41,500 – 900p = 0

Or, p = 46.11

To ascertain whether the value of p obtained corresponds to a maxima, we have to take help of sufficient condition written above

Again differentiating both sides of (i) with respect to 'p' we get,

d^2/dp^2[R(p)] = - 900 < 0

So there exist a Maxima at p = 46.11

Thus the price to be charged to maximize the Total Revenue is ₹ 46.11/-

(b)

Let the best fit Linear Trend line to the given data be y = a + bx

(Origin at the middle of the years 2014 & 2015 and x unit = 6 months)

Normal equations are   Σy = a.n + b.Σx-----------(1) where n = No. of years = 10 (here)

                           Σxy = a.Σx + b.Σx ^{2}-----------(2)

Using the values (from calculations below) of Σy, Σx and n in equation (1) we get

FINAL EXAMINATION

MODEL ANSWERS

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STRATEGIC COST MANAGEMENT

SET - 2

TERM – DEC 2025

SYLLABUS 2022

$192 = a.10 + b.0$

Or, $a = 19.2$

Also using the values (from calculations below) of Σxy, Σx and Σx^2 and putting in the equation (2) we get, $177 = a.0 + b.330$

Or, $b = 0.536$

Calculations for fitting Straight Line Trend				
Year	Sales (y in ₹ Millions)	x	x^2	xy
2010	15.3	-9	81	-137.7
2011	14.6	-7	49	-102.2
2012	16.8	-5	25	-84
2013	17.3	-3	9	-51.9
2014	17.2	-1	1	-17.2
2015	20.9	1	1	20.9
2016	22.3	3	9	66.9
2017	20.0	5	25	100
2018	23.1	7	49	161.7
2019	24.5	9	81	220.5
Total	192	0	330	177

So the required equation of Straight Line Trend is $y = 19.2 + 0.536x$

(Origin = At the middle of 2014 & 2015, x unit = 6 months)

For the year 2025, x = 21. So the estimated sales for the year 2025 = $19.2 + 0.536 \times 21$ = ₹30.456 Million. Yearly rate of increase in Sales = b = 0.536. So monthly rate of increase in Sales = b/12 = ₹0.0467 Million.