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 × 2=30]**

(i) The shadow price of skilled labour for SD Ltd. is currently ₹10 per hour. What does this mean?

a) The cost of obtaining additional skilled labour is ₹10 per hour.
b) There is a hidden cost of ₹10 for each hour of skilled labour actively worked.
c) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained.
d) The total costs will be reduced by ₹10 for each additional hour of skilled labour that can be obtained.

(ii) The product of XYZ company is sold at a fixed price of ₹1,500 per unit. As per company's estimate, 500 units of the product are expected to be sold in the coming year. If the value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:

a) ₹930
b) ₹950
c) ₹1950
d) ₹1050

(iii) Ankit Ltd., operates throughput accounting system. The details of product A per unit are as under: Selling Price: ₹75
Material Cost: ₹30
Conversion Cost: ₹20
Time to bottleneck resources: 10 minutes.
What is the throughput contribution per bottleneck resource per hour?

a) ₹270
b) ₹150
c) ₹120
d) ₹90

(iv) 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) 30%
c) 25%
d) 40%

(v) XYZ Ltd. has the following alternative planned activity levels:

Total cost (₹)
1,00,000 (Level E)
1,50,000 (Level F)
2,00,000 (Level G)
No. of units produced:
5,000 (Level E)
10,000 (Level F)
15,000 (Level G)
If fixed overhead remains constant, then fixed overhead cost per unit at Level E is:

a) ₹10
b) ₹20
c) ₹25
d) ₹30

(vi) The Tech Company has fixed costs of ₹400,000 and variable costs are 75% of the selling price. To realize profits of ₹100,000 from sales of 5,00,000 units, the selling price per unit is:

a) ₹2
b) ₹3
c) ₹4
d) ₹5

(vii) The Objective Function of a LPP is $Z = 3x_1 + 2x_2$. If $x_1 = 10$ and $x_2 = 5$ then the value of Z is –

a) 35
b) 40
c) 45
d) 50

(viii) For a Cost Function $TC = 3Q^2\ 7Q + 12$, MC is –

a) 3Q + 7
b) 6Q
c) 3Q + 14
d) 6Q + 7

(ix) How long will it take to produce the fifth unit with 85% learning rate, if the third unit took 13 hours?

a) 10.3 hours
b) 10 hours
c) 11.5 hours
d) 9.73 hours

(x) The Normal duration and Normal cost of an activity are 10 days and ₹350 respectively. The cost slope is ₹75 per day. If the Crash duration is 8 days, then what is the Crash cost of the activity?

a) 400
b) 500
c) 600
d) 650

(xi) Game theory models are classified by the

a) Number of players
b) Sum of all payoffs
c) Number of strategies
d) All of these?

(xii) 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

(xiii) What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?

a) The variable manufacturing cost of the component
b) The total manufacturing cost of the component
c) The total variable cost of the component
d) Zero

(xiv) #Script Ends – is related to which type of programming language?

a) SAS
b) Python
c) SPSS:
d) none of the above

(xv) Which one of the following is not a spreadsheet?

a) Google Sheets
b) MS Excel
c) E-views
d) Quip

SECTION – B

Answer any 5 questions out of 7 questions given. Each question carries 14 marks. [5 × 14 = 70]

2) A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally. The current sales and cost data are given below:

Sales	₹16.00 lakhs
Direct Material	₹5.80 lakhs
Direct Labour	₹2.40 lakhs
Variable Overheads	₹0.60 lakhs
Fixed Overheads	₹5.20 lakhs

The following alternatives are available to the management:

A. Continue with domestic sales and reject the export order.

B. Accept the export order and allow the domestic market to starve to the extent of excess of demand.

C. Increase capacity so as to accept the export order and maintain the domestic demand by:

(i) Purchasing additional plant and increasing 10% capacity and thereby increasing fixed overheads by ₹65,000, and

(ii) Working overtime at one and half time the normal rate to meet balance of the required capacity.

Required: Evaluate each of the above alternatives and suggest the best one. [14]

3) (a) A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division has full authority to decide on sale of the division's output to outsiders and to other divisions.

Division C has always purchased its requirements of a component from Division A. but when informed that Division A was increasing its selling price to ₹150, the manager of Division C decided to look at outside suppliers. Division C can buy the components from an outside supplier for ₹135. But Division A refuses to lower its price in view of its need to maintain its return on the investment. The top management has the following information:

C's annual purchase of the component: 1,000 units

A's variable costs per unit: ₹120

A's fixed cost per unit: ₹20

Analyse:

(i) Will the company as a whole benefit, if Division C buys the component at ₹135 from an outside supplier?

(ii) If Division A did not produce the material for Division C, it could use the facilities for other activities resulting in a cash operating savings of ₹18,000. Should Division C then purchase from outside sources?

(iii) Suppose there is no alternative use of Division A's facilities and the market price per unit for the component drops by ₹20. Should Division C now buy from outside. [7]

(b) CELO Company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that for every reduction of ₹10 in Selling Price, the demand is doubled.

i) Calculate the Target Cost at full capacity, if Profit Margin on Sale is 25%?

ii) What should be the Cost Reduction Scheme at full capacity if at the present level 40% of the cost is variable and Total Fixed Cost is ₹36 lakhs?

iii) If Rate of Return desired is 16%, Calculate the maximum investment at full capacity. [7]

4) (a) Production overheads of XYZ Manufacturers Pvt. Ltd. for 500 units of product X are Machine oriented activity cost: ₹1,35,400
Material ordering overheads: ₹69,570
Machine hours are 1.50 hrs per unit and No. of material orders are 6 per unit.
Raw material cost ₹300 per unit and labour cost ₹150 per unit.
Calculate the Total cost of X per Unit? [7]

(b) Quality impacts all aspects of an organization and can result in significant costs. These costs are generally classified into two broad categories: quality control costs and quality failure costs. Discuss the differences between these two categories with examples. [7]

5. The summarized results of a company for the two years ended 31st December 2023 and 2024 are given below:

Year	2024	2023
Particulars	₹ lacs	₹ lacs
Sales	770	600
Direct Materials	324	300
Direct Wages	137	120
Variable Overheads	69	60
Fixed Overheads	150	80
Profit	90	40

As a result of re-organisation of production methods and extensive advertisement campaign use, the company was able to secure an increase in the selling prices by 10% during the year 2024 as compared to the previous year. In the year 2023, the company consumed 1,20,000 Kgs. of raw materials and used 24,00,000 hours of direct labour. In the year 2024, the corresponding figures were 1,35,000 kgs of raw materials and 26,00,000 hours of direct labour.

You are required to:
Use information given for the year 2023 as the base year information to analyze the results of the year 2024 and to show in a form suitable to the management the amount each factor has contributed by way of price, usage and volume to the change in profit in 2024. [14]

6. (a) The products of two Plants A and B are to be transported to three Warehouses W_1, W_2 and W_3. The costs (₹'00) of transportation of each unit from Plants to the Warehouses are indicated in the table below. Also provided are the Supply Capacities of the Plants and the Demands of the three Warehouses.

	Warehouse W_1	Warehouse W_2	Warehouse W_3	Supply Capacity
Plant A	25	17	25	300
Plant B	15	10	18	500
Demand	300	300	500	1100 \ 800

Find the Optimum Distribution Schedule and calculate the associated Cost of Transportation. [7]

(b) A businessman is considering taking over a certain new business. Based on past information and his own knowledge of the business, he works out the probability distribution of the monthly costs and sales revenues, as given here:

Cost (in ₹)	Probability	Sales Revenue (₹)	Probability
17000	0.10	19000	0.10
18000	0.10	20000	0.10
19000	0.40	21000	0.20
20000	0.20	22000	0.40
21000	0.20	23000	0.15
		24000	0.05

Use the following sequences of random numbers for estimating costs and revenues. Prepare the probability distribution of the monthly net revenue.

Sequence 1	82	84	28	82	36	92	73	91	63	29
(for Cost)	27	26	92	63	83	02	10	39	10	10
Sequence 2	39	72	38	29	71	83	19	72	92	59
(for Revenue)	49	39	72	94	04	92	72	18	09	00

[7]

7. The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1—2	6	600	4	1,000
1—3	4	600	2	2,000
2—4	5	500	3	1,500
2—5	3	450	1	650
3—4	6	900	4	2,000
4—6	8	800	4	3,000
5—6	4	400	2	1,000
6—7	3	450	2	800

The indirect cost per day is ₹100.

(i) Prepare the network and identify the critical path.

(ii) Calculate the normal project duration and associated cost.

Crash the relevant activities systematically and determine the optimum project completion time and cost.

[14]

8. (a) The Management of a company is negotiating with its Union for revision of hourly wages of its employees. The Management deployed a Consulting Firm who has prepared a payoff matrix for the purpose which indicates the additional hourly cost (in ₹) to the company. It is shown below: you being a part of the Consulting Firm have to assist the Management in selecting the best strategy. Calculate the value of the game? Analyse how is it going to affect the company's cost?

Management's Strategies	Strategies of the Union			
	U1	U2	U3	U4
M1	2.50	2.70	3.50	– 0.20
M2	2.00	1.60	0.80	0.80
M3	1.40	1.20	1.50	1.30
M4	3.00	1.40	1.90	0

[7]

(b) There are two variables that need to be studied – Exports of raw cotton and Imports of manufactured goods into India. Following dataset for 7 years is provided. Suggest what kind of regression model should be used here? What are the results of this regression? Analyse the model estimators.

	₹ in Crores						
Exports	42	44	58	55	89	98	60
Imports	56	49	53	58	67	76	58

[7]