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

(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.

(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

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]

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]

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]

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]

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]

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]

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 ₹. Suggest what price should have been charged to maximize the total revenue? [7]

(b) From the following past data of Sales (in lakhs Rupees) 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]