

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-IV Computer Science & Business Systems : SUMMER : 2025
SUBJECT: OPERATION RESEARCH

Day : Wednesday

Date : 04/06/2025

S-29289-2025

Time : 10:00 AM-01:00 PM

Max. Marks : 60

Date:

NB :

1. All questions are COMPULSORY.
2. Figures to the right indicate FULL marks for the question.
3. Draw neat labelled diagrams WHEREVER necessary.
4. Assume suitable data, if necessary.

Q. 1 State and Explain the various mathematical models used in operation research. (10)

OR

Q. 1 Explain in detail the scientific method used in operation research. (10)

Q. 2 Solve the following linear programming problem using Graphical method (10)

$$\text{Maximize, } Z = 3x_1 + 4x_2$$

$$\text{Subjected to } 5x_1 + 4x_2 \leq 200$$

$$3x_1 + 5x_2 \leq 150$$

$$5x_1 + 4x_2 \geq 100$$

$$8x_1 + 4x_2 \geq 80$$

$$x_1, x_2 \geq 0$$

OR

Q. 2 Solve the following linear programming problem using Simplex method (10)

$$\text{Maximize, } Z = 4x_1 + 3x_2 + 6x_3$$

$$\text{Subjected to } 2x_1 + 3x_2 + 2x_3 \leq 440$$

$$4x_1 + 3x_3 \leq 470$$

$$2x_1 + 5x_2 \leq 430$$

$$x_1, x_2 \geq 0$$

Q. 3 Find the initial basic feasible solution using Northwest corner method for the following Transportation Problem. Also find the optimal transportation plan (10)

Destinations

| | | A | B | C | D | E | Demand |
|--------|---|----|----|----|----|----|--------|
| Source | 1 | 5 | 1 | 8 | 7 | 5 | 15 |
| | 2 | 3 | 9 | 6 | 7 | 8 | 25 |
| | 3 | 4 | 2 | 7 | 6 | 5 | 42 |
| | 4 | 7 | 11 | 10 | 4 | 9 | 35 |
| Supply | | 30 | 20 | 15 | 10 | 20 | |

OR

- Q. 3 Find the optimum solution for the following assignment problem (10)

| | I | II | III | IV | V |
|---|----|----|-----|----|----|
| 1 | 11 | 17 | 8 | 16 | 20 |
| 2 | 9 | 7 | 12 | 6 | 15 |
| 3 | 13 | 16 | 15 | 12 | 16 |
| 4 | 21 | 24 | 17 | 28 | 26 |
| 5 | 14 | 10 | 12 | 11 | 13 |

- Q. 4 A project schedule has the following characteristics (10)

| Activity | 1-2 | 1-3 | 2-4 | 3-4 | 3-5 | 4-9 | 5-6 | 5-7 | 6-8 | 7-8 | 8-10 | 9-10 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| Time (days) | 4 | 1 | 1 | 1 | 6 | 5 | 4 | 8 | 1 | 2 | 5 | 7 |

Construct the network diagram, calculate EST and LCT, determine critical path and calculate total and free float.

OR

- Q. 4 Explain in detail the tools and techniques used in project Management. (10)
- Q. 5 A stockiest has to supply 12000 units of a product per year to his customers. The demand is fixed and known. The shortage cost is assumed to be infinite. The inventory holding cost is Rs. 0.20 per unit per month and the ordering cost per order is Rs.300. Determine the optimal lot size, the optimal scheduling period and the minimum total variable yearly cost. (10)

OR

- Q. 5 Explain in detail the inventory model with demand rate uniform and replenishment rate finite. (10)

Q. 6

(10)

Explain in detail the various elements of queuing system and operating characteristics of queuing systems.

OR

Q. 6

(10)

A company manufactures around 200 bikes. Depending on the availability of raw materials and other conditions, the daily production has been varying from 196 moped to 204 moped, whose probability distribution is as given below:

| | | | | | | | | | |
|--------------------|------|------|------|------|------|------|------|------|------|
| Production per day | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 |
| Probability | 0.05 | 0.09 | 0.12 | 0.14 | 0.20 | 0.15 | 0.11 | 0.08 | 0.06 |

The finished bikes are transported in a specially designed three-storied lorry that can accommodate only 200 bikes. Using the following 15 random numbers 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54 and 10. Simulate the process to find out the average number of bikes waiting in the factory and what will be the number of empty space in the lorry.

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