

R19
Code No: 863AB
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA III Semester Examinations, July/August - 2021
OPERATIONS RESEARCH
Time: 3Hours
Max.Marks:75

Answer any five questions
All questions carry equal marks

- - -

1. Solve the following LPP using the simplex method.

$$\text{Max } Z = x_1 - x_2 + 3x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_3 \leq 3$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

[15]

2. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients X and Y. X costs Rs. 5 per kg and Y costs Rs. 8 per kg. Strength considerations dictate that the brick contains not more than 4 kg of X and a minimum of 2 kg of Y. Since the demand of the product is likely to be related to the price of the brick, find graphically the minimum cost of the brick satisfying the above conditions.

[15]

3. The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below, when should the machine be replaced? [15]

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------------------|------|------|------|------|------|------|------|------|
| Maintenance cost in Rs. | 900 | 1200 | 1600 | 2100 | 2800 | 3700 | 4700 | 5900 |
| Resale value in Rs. | 4000 | 2000 | 1200 | 600 | 500 | 400 | 400 | 400 |

4. A machine operator has to perform two operations turning and threading on a number of different jobs. The time required to perform these operations for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to complete all the jobs. [15]

| Machine/Job | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|---|----|---|---|---|----|
| A | 3 | 12 | 5 | 2 | 9 | 11 |
| B | 8 | 10 | 9 | 6 | 3 | 1 |

5. Solve the following travelling salesman problem and find the shortest possible path.

[15]

| | A | B | C | D | E |
|---|----------|----------|----------|----------|----------|
| A | ∞ | 3 | 6 | 2 | 3 |
| B | 3 | ∞ | 5 | 2 | 3 |
| C | 6 | 5 | ∞ | 6 | 4 |
| D | 2 | 2 | 6 | ∞ | 6 |
| E | 3 | 2 | 4 | 6 | ∞ |

6. Solve the game whose payoff matrix for the player A is given in table.

[15]

| Player A | Player B | | | |
|----------|----------|----|----|-----|
| | | I | II | III |
| | I | -2 | 15 | -2 |
| | II | -5 | -6 | -4 |
| | III | -5 | 20 | -8 |

7. In a railway yard goods train arrive at a rate of 30 trains/day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following:

- The average number of trains in the queue.
- The average number of trains in the system.
- The probability that number of trains in the system exceeds 10.

[15]

- State the Bellman's Principle of Optimality.
- What are the applications of dynamic programming?

[7+8]

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