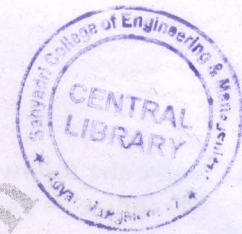


CBCS SCHEME



USN

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15CS653

Sixth Semester B.E. Degree Examination, June/July 2019 Operation Research

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define operation research. List and explain the various phases of an operation research study. (08 Marks)
- b. A firm manufactures three products A, B and C. The profits per unit product are Rs.3, Rs.2 and Rs.4 respectively. The firm has two machines and the required processing time in minutes for each machine on each product is given below :

| Machine | Product | | |
|---------|---------|---|---|
| | A | B | C |
| X | 4 | 3 | 5 |
| Y | 2 | 2 | 4 |

Machines X and Y have 2000 and 1500 machine-minutes respectively. The firm must manufacture 100A's, 200B's and 50C's but not more than 150A's. Set up an LP model to maximize the profit. (08 Marks)

OR

- 2 a. Use the graphical method to solve the following LPP :
Maximize $Z = x + 0.5y$
Subject to constraints $3x + 2y \leq 12$
 $5x \leq 10$
 $x + y \leq 18$
 $-x + y \geq 4$
where $x, y \geq 0$. (12 Marks)
- b. Define i) Feasible solution ii) unbounded solution iii) Feasible region iv) Optimal solution. (04 Marks)

Module-2

- 3 a. Find all the basic solutions of the following problem :
Maximize $Z = x_1 + 3x_2 + 3x_3$
Subject to constraints $x_1 + 2x_2 + 3x_3 = 4$
 $2x_1 + 3x_2 + 5x_3 = 7$
Also find which of the basic solution are :
i) basic feasible ii) non-degenerate basic feasible iii) optimal basic feasible. (06 Marks)
- b. Solve the following LPP by Big-M method.
Maximize $Z = -2x_1 - x_2$
Subject to constraints $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 4$
where $x_1, x_2 \geq 0$. (10 Marks)

OR

- 4 a. Solve the following LPP by simplex method.

Maximize $z = 3x_1 + 2x_2$

Subject to constraints $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 4$

and $x_1, x_2 \geq 0$.

(08 Marks)

- b. Solve the following LPP by two-phase simplex method.

Maximize $z = 3x_1 - x_2$

Subject to constraints $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 2$

$x_2 \leq 4$

and $x_1, x_2 \geq 0$

(08 Marks)

Module-3

- 5 a. Write applications of dual simplex method.

(06 Marks)

- b. Solve by dual simplex method the following problem :

Maximize $z = 2x_1 + 2x_2 + 4x_3$

Subject to constraints $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$.

(10 Marks)

OR

- 6 a. Construct the dual of the problem :

i) minimize $z = 3x_1 - 2x_2 + 4x_3$

subject to constraints $3x_1 + 5x_2 + 4x_3 \geq 7$

$6x_1 + x_2 + 3x_3 \geq 4$

$7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 3$

$4x_1 + 7x_2 - 2x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$.

(05 Marks)

ii) maximize $z = 3x_1 + 5x_2$

subject to constraints $2x_1 + 6x_2 \leq 50$

$3x_1 + 2x_2 \leq 35$

$5x_1 - 3x_2 \leq 10$

$x_2 \leq 20$

where $x_1, x_2 \geq 0$.

(05 Marks)

- b. What are the advantages of duality property?

(06 Marks)

Module-4

- 7 a. Find the initial basic feasible solution by using North-West corner rule.

(06 Marks)

| | D ₁ | D ₂ | D ₃ | D ₄ | Supply |
|----------------|----------------|----------------|----------------|----------------|--------|
| O ₁ | 1 | 5 | 3 | 3 | 34 |
| O ₂ | 3 | 3 | 1 | 2 | 15 |
| O ₃ | 0 | 2 | 2 | 3 | 12 |
| O ₄ | 2 | 7 | 2 | 4 | 19 |

Demand 21 25 17 17 80

- b. Find the initial basic feasible solution using Vogel's approximation method.

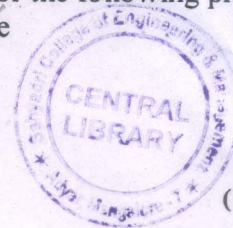
(10 Marks)

| | W ₁ | W ₂ | W ₃ | W ₄ | Availability |
|----------------|----------------|----------------|----------------|----------------|--------------|
| F ₁ | 19 | 30 | 50 | 10 | 7 |
| F ₂ | 70 | 30 | 40 | 60 | 9 |
| F ₃ | 40 | 8 | 70 | 20 | 18 |
| Requirement | 5 | 8 | 7 | 14 | |

OR

- 8 a. Solve by matrix minima method and obtain an optimal solution for the following problem:

| | Available | | | |
|----------|-----------|-----|-----|---|
| | 50 | 30 | 220 | 1 |
| From | 90 | 45 | 170 | 3 |
| | 250 | 200 | 50 | 4 |
| Required | 4 | 2 | 2 | |



(10 Marks)

- b. Solve the following assignment problem :

| | J ₁ | J ₂ | J ₃ | J ₄ |
|---|----------------|----------------|----------------|----------------|
| A | 2 | 10 | 9 | 7 |
| B | 15 | 4 | 14 | 8 |
| C | 13 | 14 | 16 | 11 |
| D | 3 | 15 | 13 | 8 |

(06 Marks)

Module-5

- 9 a. Define : i) pure strategy ii) mixed strategy iii) optimal strategy.
 b. Solve the following game by dominance principle.

(06 Marks)

| | | Player B | | | |
|----------|----------------|----------------|----------------|----------------|----------------|
| | | B ₁ | B ₂ | B ₃ | B ₄ |
| Player A | A ₁ | 3 | 2 | 4 | 0 |
| | A ₂ | 3 | 4 | 2 | 4 |
| | A ₃ | 4 | 2 | 4 | 0 |
| | A ₄ | 0 | 4 | 0 | 8 |

(10 Marks)

OR

- 10 a. Solve the following game by graphical method:

(06 Marks)

| | | Player B | | | | |
|----------|----|----------|----|-----|----|---|
| | | I | II | III | IV | V |
| Player A | I | 2 | -1 | 5 | -2 | 6 |
| | II | -2 | 4 | -3 | 1 | 0 |

- b. Write short notes on :
 i) Genetic algorithm
 ii) Tabu search algorithm.

(10 Marks)
