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06CS661

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

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define operations research. Explain the phases of operations research. **(08 Marks)**

b. Explain the various techniques used in operations research. **(06 Marks)**

c. Solve the following LPP by graphical method:

$$\text{Min } z = 20x_1 + 10x_2$$

$$\text{Subject to } x_1 + 2x_2 \le 40$$

$$3x_1 + x_2 \ge 30$$

$$4x_1 + 3x_2 \ge 60$$

$$\text{and } x_1, x_2 \ge 0$$

(06 Marks)

2 a. Define the following with respect to LPP. Give example for each.
(i) Feasible solution (ii) Feasible region. (iii) Infeasible solution. **(06 Marks)**

b. Solve the following LPP using simplex method:

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

$$\text{Subject to } 3x_1 + 2x_2 + x_3 \le 3$$

$$2x_1 + x_2 + 2x_3 \le 2$$

$$\text{Where } x_1, x_2, x_3 \ge 0.$$

(10 Marks)

c. Why simplex method is better than graphical method? **(04 Marks)**

3 a. Solve the following LPP by Trial and Error method:

$$\text{Max } z = 3x_1 + 4x_2$$

$$\text{Subject to } x_1 + x_2 \le 450$$

$$2x_1 + x_2 \le 600$$

$$\text{where } x_1, x_2 \ge 0.$$

(10 Marks)

b. Use Simplex method to solve the following problem:

$$\text{Max } z = 2x_1 + 5x_2$$

$$\text{Subject to } x_1 + 4x_2 \le 24.$$

$$3x_1 + x_2 \le 21$$

$$x_1 + x_2 \le 9$$

$$x_1, x_2 \ge 0$$

(10 Marks)

4 a. Construct the dual of the primal problem:

$$\text{Max } z = 2x_1 + x_2 + x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 \ge 6,$$

$$3x_1 - 2x_2 + 3x_3 = 3,$$

$$-4x_1 + 3x_2 - 6x_3 = 1.$$

$$x_1, x_2, x_3 \ge 0.$$

(10 Marks)

b. Write the dual corresponding to,

$$x_1 + x_2 + 2x_3 \le 120$$
$$3x_1 - 2x_2 - x_3 \ge 90$$
$$2x_1 + 4x_2 + 2x_3 = 100$$
$$5x_1 + 8x_2 + 10x_3 = \max z$$
$$x_1,\ x_2,\ x_3 \ge 0$$

Use Simplex method and obtain the zeroth and first iterates of the dual. **(10 Marks)**

PART – B

5 a. Explain dual-simplex algorithm with a neat flow chart. **(10 Marks)**

b. Use dual-simplex method to solve the LPP

Min $z = x_1 + x_2$.

Subject to $2x_1 + x_2 \ge 2$

$$-x_1 - x_2 \ge 1$$
$$x_1, x_2 \ge 0$$

(10 Marks)

6 a. Explain Hungarian Algorithm with example. **(10 Marks)**

b. Solve the following assignment problem:. **(10 Marks)**

		M_1	M_2	M_3	M_4	M_5
Jobs	J_1	9	11	15	10	11
	J_2	12	9	-	10	9
	J_3	-	11	14	11	7
	J_4	14	8	12	7	8

7 a. Define the following:

(i) Two person-zero sum game
(ii) Saddle point.
(iii) Pure strategy
(iv) Mixed strategy.
(v) Dominance principle. **(10 Marks)**

b. Solve the following 2×5 game by graphical method: **(10 Marks)**

		Player B				
		1	2	3	4	5
Player A	1	-5	5	0	-1	8
	2	8	-4	-1	6	-5

8 Write a short notes on:

a. Tabu search algorithm.
b. Simulated annealing algorithm.
c. Genetic algorithm.
d. Nature of Metaheuristics. **(20 Marks)**

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