USN ☐☐☐☐☐☐☐☐☐☐ **10CS/IS661**

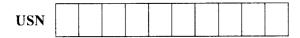## Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Operations Research

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are different phases of operation research? Briefly explain phases of operations research study. **(08 Marks)**

b. Old hens can be brought at ₹50/each but young ones cost ₹100/- each. The old hens lay 3 eggs/week and young ones lay 5 eggs/week. Each egg sold at ₹2/-. A hen costs ₹5/week to feed. If a person has only ₹3000/- to spend for hens. Formulate the problem to decide how many of each kind of hen should he buy? Assume that he cannot house more than 50 hens. **(06 Marks)**

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

2 a. Solve the following LPP by using graphical method:
   Maximize $Z = 5x_1 + 4x_2$
   Subject to $6x_1 + 4x_2 \leq 24$
   $x_1 + 2x_2 \leq 6$
   $-x_1 + x_2 \leq 1$
   $x_2 \leq 2$
   where $x_1, x_2 \geq 0$ **(08 Marks)**

b. What are methods of post optimality analysis of LPP? **(02 Marks)**

c. Solve the following LPP by using Simplex method.
   Maximize $Z = 5x_1 + 3x_2$
   Subject to $x_1 + x_2 \leq 2$
   $5x_1 + 2x_2 \leq 10$
   $3x_1 + 8x_2 \leq 12$
   where $x_1, x_2 \geq 0$ **(10 Marks)**

3 a. Solve the following by using Big-M method.
   Maximize $Z = 6x_1 + 4x_2$
   Subject to $2x_1 + 3x_2 \leq 30$
   $3x_1 + 2x_2 \leq 24$
   $x_1 + x_2 \geq 3$
   where $x_1, x_2 \geq 0$ **(10 Marks)**

b. Solve the following LPP by using Two-phase Simplex method.
   Maximize $Z = 5x_1 + 3x_2$
   Subject to $2x_1 + x_2 \leq 1$
   $x_1 + 4x_2 \geq 6$
   where $x_1, x_2 \geq 0$ **(08 Marks)**

c. Mention software packages used to solve LPP. **(02 Marks)**

4   a. Solve the following LPP by using revised Simplex method.
        Maximize $Z = 2x_1 + x_2$
        Subject to $3x_1 + 4x_2 \leq 6$
                     $6x_1 + x_2 \leq 3$
                where $x_1, x_2 \geq 0$ **(10 Marks)**

    b. Explain the following terms :
        (i) Weak duality property (ii) Strong duality property (iii) Complimentary solution property.
                                                                (06 Marks)

    c. Write the dual of the following :
        (i) Maximize $Z = 4x_1 + 10x_2 + 25x_3$ (ii) Minimize $Z = 20x_1 + 40x_2$
            Subject to $2x_1 + 4x_2 + 8x_3 \leq 25$ Subject to $2x_1 + 20x_2 \geq 40$
                         $4x_1 + 9x_2 + 8x_3 \leq 30$ $20x_1 + 3x_2 \geq 20$
                         $6x_1 + 2x_3 \leq 40$ $4x_1 + 20x_2 \geq 30$
                    where $x_1, x_2, x_3 \geq 0$ where $x_1, x_2 \geq 0$
                                                                (04 Marks)

PART – B

5   a. Briefly explain about sensitivity analysis.   **(05 Marks)**
    b. Explain primal-dual relationship with an example.   **(05 Marks)**
    c. Solve the following by using dual simplex method.
        Minimize $Z = 2x_1 + 2x_2 + 4x_3$
        Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$
                     $3x_1 + x_2 + 7x_3 \leq 3$
                     $x_1 + 4x_2 + 6x_3 \leq 5$
                where $x_1, x_2, x_3 \geq 0$ **(10 Marks)**

6   a. Solve the following transportation problem by using (i) North-West corner method (ii) Vogel's approximation method.

		Destination				
		1	2	3	4	Supply
	1	3	1	7	4	300
Source	2	2	6	5	9	400
	3	8	3	3	2	500
Demand		250	350	400	200	

                                                                (10 Marks)

    b. Solve the following assignment problem.

		Subject			
		S_1	S_2	S_3	S_4
	P_1	2	10	9	7
Professor	P_2	15	4	14	8
	P_3	13	14	16	11
	P_4	3	15	13	8

Find the schedule so as to minimize the total subject preparation time for all subjects.
                                                                (10 Marks)

7 a. Explain following terms with example :
       (i) Saddle point   (ii) Value of the game   (iii) Payoff matrix   **(06 Marks)**
   b. Solve the following game by dominance principle :

Player B

	1	2	3	4	5
1	2	5	10	7	2
2	3	3	6	6	4
3	4	4	8	12	1

Player A (rows 1, 2, 3)

(07 Marks)

   c. Solve optimally using graphical method by considering the payoff matrix of player A as shown below:

Player B

	1	2	3	4	5
1	3	6	8	4	4
2	-7	4	2	10	2

Player A (rows 1, 2)

(07 Marks)

8   Explain the following terms:
   a. Metaheuristics, advantages and disadvantages
   b. Tabu search algorithm
   c. Genetic algorithm
   d. Simulated annealing   **(20 Marks)**

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