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By K B Hemanth Raj

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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 $Z = 4x_1 + 10x_2 + 25x_3$
 Subject to $2x_1 + 4x_2 + 8x_3 \leq 25$
 $4x_1 + 9x_2 + 8x_3 \leq 30$
 $6x_1 + 2x_2 \leq 40$
 where $x_1, x_2, x_3 \geq 0$
- (ii) Minimize $Z = 20x_1 + 40x_2$
 Subject to $2x_1 + 20x_2 \geq 40$
 $20x_1 + 3x_2 \geq 20$
 $4x_1 + 20x_2 \geq 30$
 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				Supply
		1	2	3	4	
Source	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
Demand		250	350	400	200	

- b. Solve the following assignment problem.

		Subject			
		S ₁	S ₂	S ₃	S ₄
Professor	P ₁	2	10	9	7
	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
 b. Solve the following game by dominance principle :

(06 Marks)

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1

(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
Player A	1	3	6	8	4	4
	2	-7	4	2	10	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)
