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**Sixth Semester B.E. Degree Examination, December 2012**  
**Operations Research**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1
  - a. What is operations research? Mention six phases of an operations research study. (06 Marks)
  - b. Old hens can be bought at Rs.50/- each but young ones cost Rs.100/- each. The old hens lay 3 eggs/week and young hens 5 eggs/week. Each egg cost Rs.2/- A hen costs Rs.5/- per week to feed. If a person has only Rs.2000/- 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 40 hens. (07 Marks)
  - c. Solve the following L.P.P. graphically.  
 Maximize  $z = 100x_1 + 40x_2$   
 Subject to  $5x_1 + 2x_2 \leq 1000$   
 $3x_1 + 2x_2 \leq 900$   
 $x_1 + 2x_2 \leq 500$  and  
 $x_1, x_2 \geq 0$  (07 Marks)
- 2
  - a. Mention five assumptions of linear programming. (05 Marks)
  - b. Define and illustrate with examples slack variables and surplus variables. (04 Marks)
  - c. Solve the following LPP:  
 Maximize  $z = 15x_1 + 6x_2 + 9x_3 + 2x_4$   
 Subject to  $2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$   
 $3x_1 + x_2 + 3x_3 + 25x_4 \leq 24$   
 $7x_1 + x_4 \leq 70$   
 $x_1, x_2, x_3 \geq 0$  (11 Marks)
- 3
  - a. Explain two phase technique to solve LPP in simplex method. (06 Marks)
  - b. Use Big-M method to solve the following LPP:  
 Minimize  $z = 4x_1 + 3x_2$   
 Subject to  $2x_1 + x_2 \geq 10$   
 $-3x_1 + 2x_2 \leq 6$   
 $x_1 + x_2 \geq 6$   
 and  $x_1, x_2 \geq 0$  (14 Marks)
- 4
  - a. What are the important characteristics of duality? (05 Marks)
  - b. Explain the conceptual procedure of revised simplex method in standard form. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 c. Write the dual of the following LPP:

$$\text{Minimize } z = 3x_1 - 6x_2 + 4x_3$$

$$\text{Subject to } 4x_1 + 3x_2 + 6x_3 \geq 9$$

$$x_1 + 2x_2 + 3x_3 \geq 6$$

$$6x_1 - 2x_2 - 2x_3 \leq 10$$

$$x_1 - 2x_2 + 6x_3 \geq 4$$

$$2x_1 + 5x_2 - 3x_3 \geq 6$$

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

(05 Marks)

### PART – B

- 5 a. Explain sensitivity analysis.

(08 Marks)

- b. Use the dual simplex method to solve the following LPP:

$$\text{Maximize } z = -2x_1 - 2x_2 - 4x_3$$

$$\text{Subject to } 2x_1 + 3x_2 + 5x_3 \geq 2$$

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

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

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

(12 Marks)

- 6 a. Explain different steps in Hungarian algorithm to solve an assignment problem. (08 Marks)

- b. Find the optimal transportation cost of the following matrix by using least cost method. (12 Marks)

	A	B	C	D	E	Supply
P	4	1	2	6	9	100
Q	6	4	3	5	7	120
R	5	2	6	4	8	120
Demand	40	50	70	90	90	

- 7 a. Solve the game whose pay off matrix is given by.

(08 Marks)

		A		
		I	II	III
B	I	2	-1	8
	II	-4	-3	4
	III	-8	-4	0
	IV	1	-6	-2

- b. Explain the following:

- Minimax and maximin principles.
- Pure and mixed strategies.
- Two person zero sum game.
- Dominance principles.

(12 Marks)

- 8 a. Give a note on basic simulated annealing algorithm.

(05 Marks)

- b. Write an outline of a basic genetic algorithm.

(05 Marks)

- c. Explain table search algorithm.

(05 Marks)

- d. Explain decision trees.

(05 Marks)

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