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**Sixth Semester B.E. Degree Examination, December 2010**  
**Operations Research**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions,**  
**selecting at least TWO questions from each part.**  
**2. Missing data, if any, may be suitably assumed.**

**PART – A**

- 1** a. What is operations research? Explain the six phases of a study. (07 Marks)
- b. Use the graphical method to solve the problem :  
 Maximise  $Z = 10x_1 + 20x_2$   
 Subject to  $-x_1 + 2x_2 \leq 15$   
 $x_1 + x_2 \leq 12$   
 $5x_1 + 3x_2 \leq 45$   
 and  $x_1, x_2 \geq 0$ . (07 Marks)
- c. Explain the linear programming model. (06 Marks)
- 2** a. Explain the steps needed to find feasible solution using simplex method. (06 Marks)
- b. Work through the simplex method step by step to solve the following problem :  
 Minimize  $Z = x_1 - 3x_2 + 3x_3$   
 Subject to  $3x_1 - x_2 + 2x_3 \leq 7$   
 $2x_1 + 4x_2 \geq -12$   
 $-4x_1 + 3x_2 + 8x_3 \leq 10$   
 and  $x_1, x_2, x_3 \geq 0$ . (14 Marks)
- 3** a. Solve, by using Big – M method, the following linear programming problem :  
 Maximise  $Z = -2x_1 - x_2$   
 Subject to  $3x_1 + x_2 = 3$   
 $4x_1 + 3x_2 \geq 6$   
 $x_1 + 2x_2 \leq 4$   
 and  $x_1, x_2 \geq 0$ . (07 Marks)
- b. Use two-phase method to solve the problem :  
 Minimize  $Z = 0.4x_1 + 0.5x_2$   
 Subject to  $0.3x_1 + 0.1x_2 \leq 2.7$   
 $0.5x_1 + 0.5x_2 = 6$   
 $0.6x_1 + 0.4x_2 \geq 6$   
 and  $x_1, x_2 \geq 0$ . (13 Marks)
- 4** a. Apply revised simplex method to solve the following problem :  
 Maximise  $Z = 6x_1 - 2x_2 + 3x_3$   
 Subject to  $2x_1 - x_2 + 2x_3 \leq 2$   
 $x_1 + 4x_3 \leq 4$   
 and  $x_1, x_2, x_3 \geq 0$ . (14 Marks)
- b. Explain :  
 i) Weak duality property  
 ii) Strong duality property  
 iii) Complementary solutions property. (06 Marks)

## PART – B

- 5 a. Explain the key relationships between primal and dual problems. (06 Marks)  
 b. Solve the following problem by dual simplex method.

$$\text{Minimise } Z = 2x_1 + x_2$$

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

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

$$x_1 + 2x_2 \geq 3$$

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

(14 Marks)

- 6 a. Write different steps in Hungarian algorithm to solve an assignment problem. (08 Marks)  
 b. Find the initial basic feasible solution of transportation problem where cost – matrix is given below :

|        |     | Destination |    |    |    | Supply |
|--------|-----|-------------|----|----|----|--------|
|        |     | A           | B  | C  | D  |        |
| Origin | I   | 1           | 5  | 3  | 3  | 34     |
|        | II  | 3           | 3  | 1  | 2  | 15     |
|        | III | 0           | 2  | 2  | 3  | 12     |
|        | IV  | 2           | 7  | 2  | 4  | 19     |
| Demand |     | 21          | 25 | 17 | 17 |        |

(12 Marks)

- 7 a. Explain the various variations in solving games, with examples. (08 Marks)  
 b. Solve the game whose payoff matrix to the player A is given below :

|   |     | B |    |     |
|---|-----|---|----|-----|
|   |     | I | II | III |
| A | I   | 1 | 7  | 2   |
|   | II  | 6 | 2  | 7   |
|   | III | 5 | 2  | 6   |

(12 Marks)

- 8 Explain briefly :  
 a. Decision trees  
 b. Tabu search algorithm  
 c. Genetic algorithm  
 d. Metaheuristics.

(20 Marks)

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