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06CS/IS661

## Sixth Semester B.E. Degree Examination, June 2012

### Operation Research

Time: 3 hrs.

Max. Marks:100

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

#### PART - A

- 1 a. The following table gives the data for a problem. Formulate the problem as a LP model.

(06 Marks)

Raw Materials	Requirement / Unit			Availability
	I	II	III	
A	2	3	5	4000
B	4	2	7	6000
Min Demand	200	200	150	
Profit / Unit	30	20	50	

- b. Define i) Feasible solution ii) Feasible region iii) Optimal solution iv) Degeneracy  
(04 Marks)

- c. Using graphical method, solve the LPP

$$\text{Maximize } Z = 5x_1 + 4x_2$$

$$\text{Subject to } 6x_1 + 4x_2 \leq 24$$

$$x_1 + 2x_2 \leq 6$$

$$-x_1 + x_2 \leq 1$$

$$x_1, x_2 \geq 0.$$

(10 Marks)

- 2 a. Define and illustrate with examples, slack and surplus variables. (04 Marks)

- b. Find all the basic solutions to the following system of equation identifying in each case the basic and non – basic variables.

$$2x_1 + x_2 + 4x_3 = 11 \quad ; \quad 3x_1 + x_2 + 5x_3 = 14.$$

(06 Marks)

- c. Using simplex method, solve the following LPP.

$$\text{Maximize } Z = 4x_1 + 3x_2 + 6x_3$$

$$\text{Subject to } 2x_1 + 3x_2 + 2x_3 \leq 440$$

$$4x_1 + 3x_3 \leq 470$$

$$2x_1 + 5x_2 \leq 430$$

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

(10 Marks)

- 3 a. Using Big – M method, solve the following

$$\text{Minimize } Z = 3x_1 + 2x_2 + x_3$$

$$\text{Subject to } x_1 + x_2 = 7$$

$$2x_1 + x_2 + x_3 \geq 10$$

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

(10 Marks)

- b. Using Two phase method, solve the following LPP

$$\text{Maximize } Z = 7.5x_1 - 3x_2$$

$$\text{Subject to } 3x_1 - x_2 - x_3 \geq 3$$

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

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

(10 Marks)

- 4 a. Explain the basic idea behind primal – dual relationship. (04 Marks)
- b. Obtain the dual of the following primal problem
- Minimize  $Z = 3x_1 - 2x_2 - x_3$   
 Subject to  $2x_1 + 3x_2 + x_3 \leq 5$   
 $4x_1 - 2x_2 \geq 9$   
 $-8x_1 + 4x_2 + 3x_3 = 8.$  (06 Marks)
- c. Use revised simplex method to solve the following LPP
- Maximize  $Z = x_1 + x_2$   
 Subject to  $3x_1 + 2x_2 \leq 6$   
 $x_1 + 4x_2 \leq 4$   
 $x_1, x_2 \geq 0.$  (10 Marks)

### PART - B

- 5 a. Solve the following LPP using dual simplex method
- Minimize  $Z = 2x_1 + x_2$   
 Subject to  $3x_1 + x_2 \geq 3$   
 $4x_1 + 3x_2 \geq 6$   
 $x_1 + 2x_2 \geq 3$   
 $x_1, x_2 \geq 0.$  (10 Marks)
- b. Write the working procedure of dual simplex method. (05 Marks)
- c. Explain parametric integer linear programming and its importance. (05 Marks)
- 6 a. Find the initial basic feasible solution using North West corner and Vogel's approximation methods for the following transportation problem. (10 Marks)

19	30	50	10	7
70	30	40	60	9
40	8	70	20	18
5	8	7	14	

- b. Write the procedure of Hungarian method. (05 Marks)
- c. Solve the assignment problem represented by the following matrix using column reduction. (05 Marks)

	A	B	C	D
1	2	3	4	5
2	4	5	6	7
3	7	8	9	8
4	3	5	8	4

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

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	-5	2	0	7
A <sub>2</sub>	5	6	4	8
A <sub>3</sub>	4	0	2	-3

- Give the value of game and strategies adopted by A and B. (05 Marks)
- b. Find out the value of game, given the following pay off matrix (05 Marks)

	B <sub>1</sub>	B <sub>2</sub>
A <sub>1</sub>	4	-4
A <sub>2</sub>	-4	4

- c. Solve the problem Q7(b), using graphical method. (05 Marks)

- d. Find out the route of traveling sales person, given the following distances between cities.

	A	B	C	D	E
A	-	4	10	14	2
B	12	-	6	10	4
C	16	14	-	8	14
D	24	8	12	-	10
E	2	6	4	16	-

(05 Marks)

- 8 a. Explain in detail the minimum spanning tree with constraints.  
 b. Explain genetic algorithm and simulate annealing algorithm.

(08 Marks)

(12 Marks)

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