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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.***

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.

### 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

Maximize $Z = 5x_1 + 4x_2$

Subject to $6x_1 + 4x_2 \leq 24$

$x_1 + 2x_2 \leq 6$

$-x_1 + x_2 \leq 1$

$x_1, x_2 \geq 0.$ **(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.

$2x_1 + x_2 + 4x_3 = 11$ ; $3x_1 + x_2 + 5x_3 = 14.$ **(06 Marks)**

c. Using simplex method, solve the following LPP.

Maximize $Z = 4x_1 + 3x_2 + 6x_3$

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

Minimize $Z = 3x_1 + 2x_2 + x_3$

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

Maximize $Z = 7.5x_1 - 3x_2$

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.

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

**(05 Marks)**

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

| | $B_1$ | $B_2$ | $B_3$ | $B_4$ |
|---|---|---|---|---|
| $A_1$ | -5 | 2 | 0 | 7 |
| $A_2$ | 5 | 6 | 4 | 8 |
| $A_3$ | 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)**

| | $B_1$ | $B_2$ |
|---|---|---|
| $A_1$ | 4 | -4 |
| $A_2$ | -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. **(08 Marks)**

b. Explain genetic algorithm and simulate annealing algorithm. **(12 Marks)**

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