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Sixth Semester B.E. Degree Examination, June/July 2015
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. Define : i) Feasible solution ii) Feasible region iii) Optimal solution. **(06 Marks)**
 b. A manufacturer produces three models I, II, III of certain product using raw materials A and B. The following table gives the data for the problem.

Raw material	Requirement per unit			Availability
	I	II	III	
A	2	3	5	4000
B	4	2	7	6000
Minimum Demand	200	200	150	-
Profit per unit (Rs)	30	20	50	-

Formulate the problem as a linear program model.

(07 Marks)

- c. Using graphical method solve the LPP

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

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

$$x_1 + 2x_2 \leq 6$$

$$-x_1 + x_2 \leq 1$$

$$x_2 \leq 2, \quad x_1, x_2 \geq 0$$

(07 Marks)

- 2 a. Define slack variable and surplus variable. **(04 Marks)**
 b. Solve the following LPP by simplex method :

$$\text{Maximize } z = 6x_1 + 8x_2$$

$$\text{Subject to } 2x_1 + 8x_2 \leq 16$$

$$2x_1 + 4x_2 \leq 8$$

$$x_1, x_2 \geq 0$$

(10 Marks)

- c. Explain the following :

i) A standard form of the LPP

ii) Basic solution of a LPP

iii) Degeneracy and un bounded solution with respect to simplex methods. **(06 Marks)**

- 3 a. Solve the following LPP by Charne's big M method

$$\text{Maximize } z = 20x_1 + 10x_2$$

$$\text{Subject to : } x_1 + x_2 = 150$$

$$x_1 \leq 40$$

$$x_2 \geq 20$$

$$\text{where } x_1, x_2 \geq 0$$

(15 Marks)

- b. Write procedure to solve LPP of two phase simplex method. **(05 Marks)**

- 4 a. Explain the computational procedure of revised simplex method in standard form. **(10 Marks)**

- b. Explain the following:

i) Weak duality property

ii) Strong duality property

iii) Complementary solutions property

iv) Complementary optimal solution property.

(10 Marks)

PART – B

- 5 a. Use dual simplex method and solve the following LPP:

Maximize $z = 3x_1 + x_2$
 Subject to : $x_1 + x_2 \geq 1$
 $2x_1 + 3x_2 \geq 2$
 $x_1, x_2 \geq 0$

(10 Marks)

- b. Explain the role of duality theory in sensitivity analysis.

(05 Marks)

- c. Write any five key relationships between the primal and the dual problems.

(05 Marks)

- 6 a. Find an initial solution to the following transportation problem using VAM

		Destination					
		D ₁	D ₂	D ₃	D ₄	D ₅	
Origin	O ₁	7	6	4	5	9	40
	O ₂	8	5	6	7	8	30
	O ₃	6	8	9	6	5	20
	O ₄	5	2	7	8	6	10
		30	30	15	20	5	
		Demand					

Supply

(10 Marks)

- b. Solve the following assignment problem

		Jobs				
		J ₁	J ₂	J ₃	J ₄	J ₅
Machine	M ₁	11	17	8	16	20
	M ₂	9	7	12	6	15
	M ₃	13	16	15	12	16
	M ₄	21	24	17	28	26
	M ₅	14	10	12	11	15

(10 Marks)

- 7 a. Define the following with respect to games

- i) Pay – off ii) Zero – sum game iii) Saddle point

(03 Marks)

- b. Solve the following game graphically

		Player B		
		B ₁	B ₂	B ₃
Player A	A ₁	2	6	22
	A ₂	16	10	24

(07 Marks)

- c. Solve the following game:

		B			
		I	II	III	IV
A	1	20	15	12	35
	2	25	14	8	10
	3	40	2	19	5
	4	5	4	11	0

(10 Marks)

- 8 a. Write the outline of a basic table search algorithm. Explain it with the help of a minimum spanning tree problem with constraints.

(10 Marks)

- b. Write short notes on : i) simulated annealing ii) Genetic algorithms.

(10 Marks)
