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Sixth Semester B.E. Degree Examination, June/July 2017
Operations Research

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Define operations research. Explain the phases of operations research. (08 Marks)
- b. A firm can be produced 3 types of body sweaters say A, B and C. Three kinds of wool are required for it, say red wool, green wool and blue wool. One unit of type A sweater needs 2 yards of red wool and 3 yards of blue wool, one unit of type B sweater needs 3 yards red wool 2 yards of green wool and 2 yards of blue wool. One unit of type C sweater needs 5 yards of green wool and 4 yards of blue wool. The firm has only a stock of 80 yards of red wool, 100 yards of green wool and 150 yards of blue wool. It is assumed that the income obtained from each unit of type A sweater is Rs. 30, type B sweater is Rs. 50 and type C sweater is Rs. 40. Formulate this problem as LPP. (05 Marks)
- c. Using graphical method solve the following :
Maximize $Z = 3000x_1 + 2000x_2$
Subject to $x_1 + 2x_2 \leq 6$
 $2x_1 + x_2 \leq 8$
 $x_2 \leq 2$
 $-x_1 + x_2 \leq 1$
and $x_1, x_2 \geq 0$. (07 Marks)
- 2 a. Explain the setting up of simplex method. (04 Marks)
- b. Using Simplex method , solve the following LPP taking $x_1 = y_1 + 10$, $x_2 = y_2 + 20$ and $x_3 = y_3 + 30$, the LPP becomes.
Maximize $Z = 10y_1 + 15y_2 + 8y_3 + 640$
Subject to $y_1 + 2y_2 + 2y_3 \leq 90$
 $2y_1 + y_2 + y_3 \leq 150$
 $3y_1 + y_2 + 2y_3 \leq 70$
and $y_1, y_2, y_3 \geq 0$. (13 Marks)
- c. Why Simplex method is better than graphical method? (03 Marks)
- 3 a. Using Big-M method solve the following LPP :
Maximize $Z = 2x_1 + x_2$
Subject to $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 4$
 $x_1, x_2 \geq 0$. (08 Marks)
- b. Using Two-phase method solve the LPP :
Maximize $Z = -4x_1 - 3x_2 - 9x_3$
Subject to $2x_1 + 4x_2 + 6x_3 \geq 15$
 $6x_1 + x_2 + 6x_3 \geq 12$
and $x_1, x_2, x_3 \geq 0$. (12 Marks)

- 4 a. Explain the computational procedure of revised Simplex method in standard form. (08 Marks)
- b. Using revised Simplex method solve the following LPP :
 Minimize $Z = x_1 + x_2$
 Subject to $x_1 + 2x_2 \geq 7$
 $4x_1 + x_2 \geq 6$
 and $x_1, x_2 \geq 0$. (12 Marks)

PART - B

- 5 a. Explain the role of duality theory in sensitivity analysis. (05 Marks)
- b. Explain the procedure of dual Simplex method. (05 Marks)
- c. Use dual Simplex method and solve the following LPP and also find the solution to the primal.
 Minimize $Z = 2x_1 + 9x_2 + x_3$
 Subject to $x_1 + 4x_2 + 2x_3 \geq 5$
 $3x_1 + x_2 + 2x_3 \geq 4$
 and $x_1, x_2, x_3 \geq 0$. (10 Marks)
- 6 a. Find the initial basic feasible solution using North West corner rule and Vogel's approximation method 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. Find the optimal solution to the following assignment problem showing the costs (Rs) for assigning workers to jobs. (05 Marks)

		Job		
Workers	W ₁	18	17	16
	W ₂	15	13	14
	W ₃	19	20	21

- 7 a. Using the dominance concept, obtain the optimal strategies for both the players and determine the value of game. The pay off matrix for player A is given. (10 Marks)

		B				
		I	II	III	IV	V
A	I	2	4	3	8	4
	II	5	6	3	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

- b. Using Graphical method solve the following : (10 Marks)

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

- 8 Explain briefly :
- Meta heuristics
 - Decision trees
 - Simulated annealing
 - Genetic algorithm.

(20 Marks)