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10CS/IS661

**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		
	W <sub>1</sub>	18	17	16
Workers	W <sub>2</sub>	15	13	14
	W <sub>3</sub>	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)