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 $\quad x_1 + 2x_2 \le 6$

   $\quad\quad\quad\quad 2x_1 + x_2 \le 8$

   $\quad\quad\quad\quad x_2 \le 2$

   $\quad\quad\quad\quad -x_1 + x_2 \le 1$

   and $x_1, x_2 \ge 0$. **(07 Marks)**

2 a. Explain the setting up of simplex method. **(04 Marks)**

   b. Using Simplex method , solve the following LPP taking

   $x_1 = y_1 + 10$, $\quad x_2 = y_2 + 20$ and $x_3 = y_3 + 30$, the LPP becomes.

   Maximize $Z = 10y_1 + 15y_2 + 8y_3 + 640$

   Subject to $\quad\quad y_1 + 2y_2 + 2y_3 \le 90$

   $\quad\quad\quad\quad 2y_1 + y_2 + y_3 \le 150$

   $\quad\quad\quad\quad 3y_1 + y_2 + 2y_3 \le 70$

   and $y_1, y_2, y_3 \ge 0$. **(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 $3x_1 + x_2 = 3$

   $\quad\quad\quad 4x_1 + 3x_2 \ge 6$

   $\quad\quad\quad\cdot\ x_1 + 2x_2 \le 4$

   $\quad\quad\quad x_1, x_2 \ge 0$. **(08 Marks)**

   b. Using Two-phase method solve the LPP :

   Maximize $Z = -4x_1 - 3x_2 - 9x_3$

   Subject to $\quad\quad 2x_1 + 4x_2 + 6x_3 \ge 15$

   $\quad\quad\quad\quad 6x_1 + x_2 + 6x_3 \ge 12$

   and $\quad x_1, x_2\ x_3 \ge 0$. **(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		
		18	17	16
Workers	W_1	15	13	14
	W_2	19	20	21
	W_3			

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
	I	2	4	3	8	4
A	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 :
   a. Meta heuristics
   b. Decision trees
   c. Simulated annealing
   d   Genetic algorithm.

(20 Marks)