USN ☐☐☐☐☐☐☐☐☐☐ **10CS/IS661**

Sixth Semester B.E. Degree Examination, June/July 2018
Operations Research

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. What is operation research? Explain main phases of operation research, and its applications. **(07 Marks)**

   b. The ABC company is introducing two new product lines : special risk insurance and mortgages. The expected profit is Rs.5 per unit on special risk insurance and Rs.2 per unit on mortgages. Management wishes to establish sale quotas for the new product lines to maximize total expected profit. The work requirements are as follows :

Department	Works Z hours per unit		Work hours available
	Special risk	Mortgages	
A	3	2	2400
B	0	1	800
C	2	0	1200

   i) Formulate a LPP model for this problem
   ii) Use the graphical method to solve this problem. **(07 Marks)**

   c. Use the graphical method to solve this problem
   Minimize $z = 3x_1 + 2x_2$
   Subject to $x_1 + 2x_2 \geq 10$
                         $2x_1 - 3x_2 \leq 6$
                         $x_1 + x_2 \geq 6$ and
                         $x_1 \geq 0, x_2 \geq 0$. **(06 Marks)**

2 a. Explain the steps needed to find feasible solution using Simplex method. **(08 Marks)**

   b. Work through the Simplex method to solve the following problem :
   Maximize $z = -x_1 + 4x_2$
   Subject to $-3x_1 + x_2 \leq 6$
                         $x_1 + 2x_2 \leq 4$
                         $x_3 \geq -3$. **(12 Marks)**

3 a. Using Big-M method solve the following problem :
   Minimize $z = 0.4x_1 + 0.5x_2$
   Subject to $0.3x_1 + 0.1x_2 \leq 2.7$
                         $0.5x_1 + 0.5x_2 = 6$
                         $0.6x_1 + 0.4x_2 \geq 6$
                   and $x_1 \geq 0, x_2 \geq 0$. **(09 Marks)**

   b. Consider the following problem:
   Maximize $z = 3x_1 - x_2$
   subject to $2x_1 + x_2 \geq 2$
                         $x_1 + 3x_2 \leq 2$
                         $x_2 \leq 4$
   Solve this problem using two–phase method. **(11 Marks)**

4 a. Work through the revised simplex method step by step to solve the following model :

$Z = 3x_1 + 5x_2$
Subject to $2x_1 \leq 4$
$\qquad 2x_2 \leq 12$
$\qquad 3x_1 + 2x_2 \leq 18$
and $\quad x_1 \geq 0, x_2 \geq 0.$ **(12 Marks)**

b. Explain the relationship between dual and primal problem. **(08 Marks)**

PART – B

5 a. Solve the following problem by dual Simplex method :

Minimize $z = -x_1 - 3x_2$
Subject to $\qquad x_1 - 2x_2 \leq 2$
$\qquad -x_1 + x_2 \leq 4$
and $\quad x_1 \geq 0,$
$\qquad x_2 \geq 0.$ **(13 Marks)**

b. Explain the role and essence of sensitivity analysis. **(07 Marks)**

6 a. Consider the transportation problem having the following table.

		1	2	3	4	5	Supply
Source	1	2	4	6	5	7	4
	2	7	6	3	M	4	6
	3	8	7	5	2	5	6
	4	0	0	0	0	0	4
Demand		4	4	2	5	5	

(Destination across columns 1–5)

Find the best–feasible solution using following rules and compare the values of objective function.
  i) North west corner rule
  ii) Vagel's approximation method
  iii) Russel's approximation method. **(13 Marks)**

b. Explain Hungarian algorithm to solve an assignment problem with an example. **(07 Marks)**

7 a. Explain the different variations in solving games, with examples. **(08 Marks)**

b. Determine the optimal strategy for each player by successively eliminating dominated strategies. **(06 Marks)**

Player B

		1	2	3	4
Player A	1	4	5	5	8
	2	6	7	6	9
	3	5	7	5	4
	4	6	6	5	5

c. Explain the basic principles of decision making with and without experimentation. **(06 Marks)**

8 a. Discuss the sub-Tour reversal algorithm with an example. **(07 Marks)**

b. Consider the minimum spanning tree problem and
Constraints 1 : Link AD can be included only if link DE also is included
Constraints 2 : At most one of the 3 links AD, CD and AB can be included.
Starting with the initial trial solution where the inserted links are AB, AC, AD and CE and
apply tabu search algorithm to find the feasible solution. **(09 Marks)**
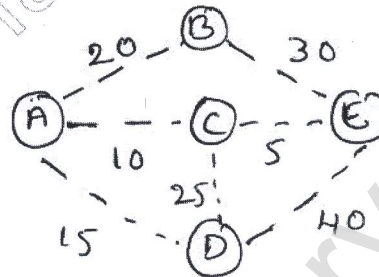

Fig.Q8(b)

c. Explain the genetic algorithm. **(04 Marks)**

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