Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**
Total No. of Questions : 07

BCA   (Sem.–5)
OPERATIONS RESEARCH
Subject Code : BC-504
Paper ID : [B0222]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

1.   **Answer briefly :**

a) Define Unbalanced Transportation Problem.

b) Write any three limitations of OR.

c) Define convex set.

d) What is basic feasible solution?

e) What is degeneracy in transportation problem? How it may be removed?

f) What do you understand by decision making under risk?

g) Explain the uses of integer Programming.

h) What is the relationship between Primal and Dual?

i) What are the assumptions in the transportation Problem?

j) What is the condition to check the optimality for a minimization Problem?

SECTION-B

2.   Explain in detail various phases in the solution of an optimization problem.

3. Find the dual of given LP problem, solve the dual and interpret the result of the solution :
   s.t. $4x + 40y \geq 160$

   $3x + 10y \geq 60$

   $4x + 5y \geq 40$

   $x, y \geq 0$

4. Solve the following LPP by simplex method :

   Maximize $Z = 3 x_1 + 2 x_2$

   s.t. $x_1 + x_2 \leq 4$

   $x_1 - x_2 \leq 2$

   $x_1, x_2 \geq 0$

5. Find the initial solution to the following transportation problem :

   Destination

		D1	D2	D3	D4	D5		
	O1	7	6	4	5	9	40	
Origin	O2	8	5	6	7	8	30	Supply
	O3	6	8	9	6	5	20	
	O4	5	2	7	8	6	10	
		30	30	15	20	5		

   Demand

6. A farmer has to plant two kinds of trees P and Q in a land of 4000 sq m area. Each P tree requires at least 25 sq m and Q tree requires at least 40 sq. m. of land. The annual water requirement of P trees is 30 units and of Q tree is 15 units per tree, while at most 3000 units of water is available. It is also estimated that the ratio of number of Q trees to the number of P trees should not be less than $\frac{6}{19}$ and should not be more than $\frac{17}{8}$. The return per tree from P is expected to be one and a half times as much as Q tree. Formulate the problem LP model.

7. What is integer Programming? Explain whether an Integer Programming Problem can be solved by rounding off the corresponding Simplex Solution.