

**2021**

**STATISTICS— GENERAL**

**Paper : DSE-A-2**

**(Operations Research)**

**Full Marks : 50**

*The questions are of equal value*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

1. Answer **any five** questions: 2×5
- (a) Define feasible solution.
  - (b) When do you need a surplus variable?
  - (c) Define hyperplane.
  - (d) When do you use Charne's M Method?
  - (e) Define duality in connection with LPP.
  - (f) When does an assignment problem become unbalanced?
  - (g) Give a real life example of an assignment problem.
  - (h) State the criteria to check for optimality of a transportation problem through the modified difference (MODI) method.
2. Answer **any two** questions: 5×2
- (a) Discuss when you can graphically conclude that an LPP has an unbounded solution.
  - (b) Define basic feasible solution. Distinguish between degenerate and non-degenerate basic feasible solution.
  - (c) Show that the intersection of two convex sets is also a convex set.
3. Answer **any three** questions: 10×3
- (a) Derive the minimum ratio exit criterion for LPP.
  - (b) Name different types of solutions of an LPP.  
Reduce the following problem in its standard form with non-negative variables.  
Maximize  $3x_1 - 4x_2 + 7x_3$   
Subject to  $7x_1 + x_2 + 7x_3 \leq 50$   
 $x_1 + 9x_2 - 5x_3 \geq 40$   
 $5x_1 + 3x_2 = 20,$   
 $x_1 \geq 0, x_2 \geq 0, x_3$  is unrestricted in sign.

**Please Turn Over**

- (c) Discuss the assumptions of a linear programming problem.
- (d) Express the transportation problem as a standard form of LPP. Show that the number of basic variables in a Transportation problem is at most  $(m+n-1)$ .
- (e) Discuss the role of an artificial variable in solving the LPP.

Formulate the dual for the following primal LPP.

Minimize  $z = 10x_1 + 6x_2 + 2x_3$

Subject to  $-x_1 + x_2 + x_3 \geq 1$

$$3x_1 + x_2 - x_3 \geq 2$$

$$5x_1 + 3x_2 = 20$$

$$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

5+5

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