PE-364

(513) M.A./M.Sc. MATHEMATICS (Third Semester)
EXAMINATION, DEC.-2021
OPERATION RESEARCH-I

Time : Three hours] **Paper - IV** **[Maximum Marks : 80**

Note : *Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.*

Section–A

1. Choose the correct answer : **1×10=10**

(1) The name "Operation Research" is coined in the year :

(a) 1945 (b) 1935 (c) 1940 (d) 1950

(2) The person who coined the name "Operation Research" is :

(a) Bellman (b) Newman

(c) McClasky and Trefrhen (d) None of the above.

(3) Following is a method of solving LPP :

(a) Vogel's Approximation Method (b) Maximum Method

(c) Simplex Method (d) None of these

(4) When the elements of net evaluation row of simplex tables are equal, the situation is known as :

(a) Tie (b) Degeneracy (c) Break (d) Shadow Price

(5) For a minimization problem, the objective function coefficient for an artificial variable is :

(a) +M (b) –M (c) Zero (d) None of the above

(6) If negative value appears in solution value column of the simplex table is negative, then the solution is :

(a) Infeasible (b) Unbounded (c) Optimal (d) None of the above

(7) Dual of dual is :

(a) Primal (b) Dual (c) Prima dual (d) None of the above

(8) If primal problem is a maximization problem, then the dual will be :

(a) Maximization Problem (b) Mixed Problem

(c) Minimization Problem (d) None of the above

(9) Transportation model helps us in :

(a) finding nearest transport office (b) finding transportation cost between two cities

(c) finding lowest transportation cost (d) None of the above

(10) The assignment problem is solved by :

(a) Simplex method (b) Graphical method

(c) Vector method (d) Hungarian method

2. Answer the following questions : **2×5=10**

(1) Discuss scientific method in OR.

(2) What is matrix form of the LPP ?

(3) Explain the following :

(a) Infeasibility (b) Degeneracy

[P.T.O.]

(4) Differentiate between primal and dual LPP.

(5) Define :

(a) Loop (b) Oriented path

Section–B

Answer the following questions : **12×5=60**

3. Write major steps in the solution of LPP by graphical method.

OR

Using simplex method, solve

Maximize $z = 5x_1 + 3x_2$

Subject to constraint

$$x_1 + x_2 \leq 2$$
$$5x_1 + 2x_2 \leq 10$$
$$3x_1 + 8x_2 \leq 12$$

and $x_1, x_2 \geq 0$

4. Solve by penalty method or Big-M method

Maximize $z = 2x_1 + x_2 + 3x_3$

Subject to constraint

$$x_1 + x_2 + 2x_3 \leq 5$$
$$2x_1 + 3x_2 + 4x_3 = 12$$

and $x_1, x_2, x_3 \geq 0$

OR

Solve the following LPP, by the simplex dual algorithm

Min $z = x_1 + 2x_2 + 3x_3$

S.t. $2x_1 - x_2 + x_3 \geq 4$

$x_1 + x_2 + 2x_3 \leq 8$

$x_2 - x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$

5. Solve graphically, the following LPP :

min $Z = 3x_1 + 5x_2$

S.t. $-3x_1 + 4x_2 \leq 12$

$2x_1 - x_2 \geq -2$

$2x_1 + 3x_2 \geq 12$

$x_1 \leq 4, x_2 \geq 2$

and $x_1, x_2 \geq 0$

OR

Solve the following LPP

Maximize $Z = 40x + 35y$

S.t. $2x + 3y \leq 60$

$4x + 3y \leq 96$

$4x + 35y \leq 105$

and $x, y \geq 0$

6. Solve the following assignment problem :

Max.

Task	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

OR

Solve minimal assignment problem whose effectiveness matrix is :

	I	II	III	IV
A	2	3	4	5
B	4	5	6	7
C	7	8	9	8
D	3	5	8	4

7. Solve the following transportation problem :

To

From	1	2	3	4	**Supply**
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Demand	6	10	12	15	43

OR

Draw a network diagram on the basis of the following data :

Activity	**Duration**
1–2	2
1–4	2
1–7	1
2–3	4
3–6	1
4–5	5
4–8	8
5–6	4
6–9	3
7–8	3
8–9	5
9–10	2

Find the critical path, total duration and slack times.