5 SEM TDC DSE STS (CBCS) 1 (H/NH)

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(Held in January/February, 2022)

STATISTICS

(Discipline Specific Elective)

(For Honours/Non-Honours)

Paper : DSE–1

(Operations Research)

Full Marks : 50
Pass Marks : 20

Time : 2 hours

The figures in the margin indicate full marks
for the questions

1. Select the correct answer from the following
   alternatives :   1×5=5

   (a) The objective of operations research is

   (i) to find new methods of solving
        problems

   (ii) to derive formulas

   (iii) optimal utilization of existing
        resources

   (iv) to utilize the services of scientists

(b) The slack variables indicate

    (i) excess resource available

    (ii) shortage of resource available

    (iii) no resources available

    (iv) idle resource available

(c) The total number of allocation in a basic feasible solution of a transportation problem of size $m \times n$ is equal to

    (i) $m \times n$

    (ii) $(m/n) - 1$

    (iii) $m + n + 1$

    (iv) $m + n - 1$

(d) Consider the following two-person game and determine the saddle point if it exists :

	Y_1	Y_2
X_1	4	6
X_2	5	-3

    (i) $X_1 Y_2$

    (ii) $X_1 Y_1$

    (iii) $X_2 Y_2$

    (iv) There is no saddle point

(e) Economic order quantity is the tool for controlling

   (i) inventory

   (ii) labour

   (iii) expenses

   (iv) None of the above

2. Answer the following questions in brief :

                                    2×5=10

(a) Define convex set with an example.

(b) Define artificial variables.

(c) What do you mean by non-degenerate basic feasible solution in a transportation problem?

(d) Define pay of matrix in game theory.

(e) What is set-up cost in inventory problem?

3. (a) Solve graphically the following LPP :   4

      Maximize $z = 40x_1 + 80x_2$

   subject to the constraints

$$2x_1 + 3x_2 \leq 48$$
$$x_1 \leq 15$$
$$x_2 \leq 10$$
$$x_1, x_2 \geq 0$$

Or

5.

(b) Obtain the dual of the following LPP :

Maximize $z = 2x_1 + 5x_2 + 6x_3$

subject to the constraints

$$5x_1 + 6x_2 - x_3 \leq 3$$
$$-2x_1 + x_2 + 4x_3 \leq 4$$
$$x_1 - 5x_2 + 3x_3 \leq 1$$
$$-3x_1 - 3x_2 + 7x_3 \leq 6$$
$$x_1, x_2, x_3 \geq 0$$

4. (a) Use simplex method to solve the following LPP :

Maximize $z = 4x_1 + 10x_2$

subject to the constraints

$$2x_1 + x_2 \leq 50$$
$$2x_1 + 5x_2 \leq 100$$
$$2x_1 + 3x_2 \leq 90$$
$$x_1, x_2 \geq 0$$

Or

(b) Describe the computational procedure of simplex two-phase method.

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5. (a) Write down the mathematical formulation of assignment problem. Explain the difference between transportation problem and assignment problem.

Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows : 3+2+6=11

		Jobs			
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

Persons

Or

(b) What are the different methods of finding the initial basic feasible solution of a transportation problem? Solve the following transportation problem in which cell entries represent unit costs :

2+9=11

	To			Available
	2	7	4	5
From	3	3	1	8
	5	4	7	7
	1	6	2	14
Required	7	9	18	

6. *(a)* Solve the following 2×4 game graphically :

Player B

		B_1	B_2	B_3	B_4
Player A	A_1	2	1	0	−2
	A_2	1	0	3	2

Or

(b) Explain the theory of dominance in the solution of rectangular game.

7. *(a)* Describe the different norms used for controlling inventories classified by *ABC* analysis.

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Or

(b) What is economic order quantity (EOQ) ? What are the assumptions of EOQ model?

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