

U.G. 5th Semester Examination - 2020**STATISTICS****[HONOURS]****Discipline Specific Elective (DSE)****Course Code : STAH-DSE-2****(Operations Research)**

Full Marks : 50(40+10)

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any **five** questions: $2 \times 5 = 10$

- Define convex set.
- What is a slack variable? Give an example.
- Write down the optimality condition for a given transportation problem.
- What is minimax-maximin principle?
- What is a spanning tree?
- What is a payoff matrix? Give an example.
- What is reorder point in an inventory model?
- What is ABC analysis?

2. Answer any **two** from the following: $5 \times 2 = 10$

- Describe big M method of eliminating artificial variables in simplex algorithm.
- Show that a transportation problem admits a feasible solution if and only if it is balanced.
- A plant manager has four subordinates, and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. This estimate of the times each man would take to perform each task is given in the effectiveness matrix below.

	1	2	3	4
A	19	26	24	10
B	38	19	18	15
C	13	28	4	26
D	8	26	17	11

How should the tasks be allocated, one to a man, so as to minimize the total man hours?

- Derive order quantity and ordering cycle length in a classic EOQ model without shortages.

3. Answer any **two** questions: $10 \times 2 = 20$

- Write down the fundamental theorem of linear programming.
 - Solve the problem:

[Turn over]

Maximize $z = 2x_1 + 4x_2 + 4x_3 - 3x_4$

subject to $x_1 + x_2 + x_3 = 4$

$x_1 + 4x_2 + x_4 = 8$

$x_1, x_2, x_3, x_4 \geq 0$

2+8

b) i) Define pure strategy and mixed strategy in the context of a matrix game.

ii) Explain the concept of dominance with example in the context of a matrix game.

Write down the solution of a 2×2 game when there is no saddle point in the payoff matrix.

How can you solve a $2 \times n$ game? 3+7

c) Solve the following transportation problem:

10

Plants (Origin)	Distribution Centers (Destination)				
	1	2	3	4	a_i
A	1	2	1	4	20
B	3	3	2	1	40
C	4	2	5	9	20
D	5	3	6	10	20
b_j	20	40	30	10	100

d) Write a note on duality in linear programming.

10

[Internal Assessment: 10]
