

U.G. 5th Semester Examination - 2021**STATISTICS****[HONOURS]****Discipline Specific Elective (DSE)****Course Code : STAH-DSE-T-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. Notations and symbols have their usual meaning.*1. Answer any **five** questions: $2 \times 5 = 10$

- Define convex hull of a given set of E^n .
- Why are artificial variables needed for solving a linear programming problem?
- Write down the optimality condition for a given transportation problem.
- Define two-person zero sum game.
- What is a spanning tree?
- What is the optimality criterion for solving a two-person zero sum game?
- What is lead time in an inventory model?
- What is dominance?

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

- Write down the primal form of a linear programming problem and its dual. How are the optimal solutions of these two problems related?
- Write down the mathematical formulation of an assignment problem. How does this problem differ from a transportation problem?
- Consider the following transportation problem that minimizes the total transportation cost:

	D_1	D_2	D_3	D_4	a_i
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
b_j	20	40	30	10	100

(O: Origin, D: Destination)

A feasible solution to this problem is $x_{11}=20$, $x_{12}=10$, $x_{22}=30$, $x_{23}=20$, $x_{33}=10$, $x_{34}=10$.

- Check whether this solution is a basic feasible solution.
- If yes, check whether it is optimal or not.
- If not, obtain an improved solution.

- d) Write down the expression for total cost per unit time for a classical EOQ model, explaining all the symbols used. Hence derive the EOQ and the ordering cycle length.

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

- a) i) Write down the fundamental theorem of game theory.
- ii) What is saddle point in connection with a matrix game? Derive the optimal strategies for a 2×2 game without a saddle point. $2 + 8$
- b) i) When is a linear programming problem said to have an unbounded solution? How can one identify the existence of an unbounded solution during the execution of simplex algorithm?
- ii) What is ABC analysis of inventory control? Discuss different steps of this analysis. $4 + 6$
- c) Derive the optimum order quantity for a classical EOQ model with a single price break.
- d) Write a note on post-optimality analysis in linear programming.

[Internal Assessment: 10]