Total number of printed pages–7

3 (Sem – 5/CBCS) STA HE 1

2025

STATISTICS

(Honours Elective)

Paper : STA–HE–5016

(Operations Research)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following as directed : 1×7=7

   (a) Which of the following is not associated with an LPP ?

   (i) Proportionality

   (ii) Uncertainty

   (iii) Additivity

   (iv) Divisibililty

   (Choose the correct option)

(b) The variable which should be added in case of minimization LPP along with surplus variable is called as _____.

(Fill in the blank)

(c) At any iteration of the usual Simplex method, if there is at least one basic variable in the basis at zero level and all $(Z_j - C_j) \geq 0$, the current solution is

(i) Infeasible

(ii) Unbounded

(iii) Non-degenerate

(iv) Degenerate

(Choose the correct option)

(d) In general, transportation model is used for _____ problems.

(i) Profit maximization

(ii) Cost minimization

(iii) Transportation

(iv) Assignment

(Choose the correct option)

(e) The initial solution obtained by the least-cost method would invariably by optimal. *(State True **or** False)*

(f) When maximin and minimax values of a game are same, then there is a saddle point. *(State True **or** False)*

(g) A mixed strategy game can be solved by

(i) matrix method

(ii) algebric method

(iii) graphical method

(iv) All of the above

2. Answer the following questions : 2×4=8

(a) Explain the concept of economic order quantity.

(b) What are the loops in a transportation table ?

(c) Mention *any two* basic assumptions of a two-person zero game.

(d) Define slack variable and surplus variable.

3. Answer ***any three*** of the following questions : 5×3=15

(a) Explain North-West corner rule of transportation problem.

(b) Discuss ABC analysis of an inventory system.

(c) A furniture dealer deals in only two items *viz* tables and chairs. He has Rs. 10,000 to invest and a space to store atmost 60 pieces. A table cost him Rs. 500 and a chair of Rs. 200. He can sell a table at a profit of Rs. 50 and a chair at a profit of Rs. 15. Assume that he can sell all items that he buys.

Formulate this problem as an LPP, so that he can maximize the profit.

(d) What are the basic ideas involved in EOQ concept? Discuss.

(e) Find the basic solution of the set of equations

$$2x_1 + 4x_2 - 2x_3 = 10$$
$$10x_1 + 3x_2 + 7x_3 = 33.$$

Answer ***any three*** of the following questions : 10×3=30

4. Solve the LPP by Simplex method :

Maximize $Z = x_1 + 2x_2$

subject to $-x_1 + 2x_2 \le 8$
$x_1 + 2x_2 \le 12$
$x_1 - x_2 \le 3$
$x_1, x_2 \ge 0$

5. (a) Find the basic feasible solution by least cost method. 5

	D_1	D_2	D_3	D_4	a_i
S_1	5	7	6	4	70
S_2	2	8	3	1	50
S_3	1	7	4	5	90
b_j	50	40	50	70	

(b) Prove that the necessary and sufficient condition for the existence of a feasible solution to an $m \times n$ transportation problem is $\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$, where a_i and b_j denote the availability and requirement at i^{th} origin and j^{th} destination respectively. 5

6. Derive economic order quantity model for an inventory problem when shortage of cost is not allowed.

7. Explain the maximin and minimax principles used in game theory.

8. Describe the single item production inventory model with no shortages and derive the formulae for optimum lot size for one run and the optimum time between two runs.

9. (a) Discuss least cost method of solving the transportation problem. 4

(b) What are the costs associated with inventory? Distinguish between deterministic and stochastic models in inventory theory. 6