2021

STATISTICS — HONOURS

Paper : DSE-B-1

(Operations Research)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer ***any five*** questions : 2×5

(a) Operations Research has been defined as "research into operations"— Comment.

(b) Show that if in a linear programming (minimization) problem, the objective function is minimized at more than one extreme point, then it is also minimized at every point which is a convex combination of these extreme points.

(c) When and how do we use artificial variable(s) to solve a linear programming problem?

(d) In a linear programming problem, if an artificial variable remains as a basic variable at zero level in the optimal feasible solution, how can you obtain an optimal feasible solution with all basic variables being legitimate variables?

(e) Explain the difficulty that arises when we try to solve an assignment problem using transportation algorithm.

(f) What is a matrix game? When does it have a saddle point?

(g) How do you convert a maximization assignment problem to a minimization problem?

(h) What are the assumptions made in game theory?

2. Answer ***any two*** questions : 5×2

(a) Discuss degeneracy in transportation problem.

(b) Explain the use of dominance property to solve a two-person zero-sum game.

(c) Is Operations Research approach multi-disciplinary?— Discuss.

3. Answer ***any three*** questions : 10×3

(a) Why is mathematical modeling of an optimization problem important? What is the first step in formulating a linear programming problem? Show how you can obtain the optimal feasible solution to a linear programming problem from the optimal feasible solution obtained of its dual problem using the simplex algorithm.

(b) What is an assignment problem? Discuss the Hungarian method for solving an assignment problem, explaining clearly the reasons for using the different steps.

(c) Distinguish between balanced and unbalanced transportation problems. Discuss in detail how you solve a transportation problem when the total number of allocations in the initial basic feasible solution is less than m+n-1, where m = number of origins, n = number of destinations.

(d) How can game theory be applied in real life situations? What is a finite game? When is a finite game said to be symmetric? For a 2-person zero-sum game, if the $m \times n$ payoff matrix has two saddle points, show that the values of the game at these saddle points are equal.

(e) Explain the different phases of Operations Research. Discuss the different types of models that can be used.