

KNT/KW/16/5216

**Bachelor of Science (B.Sc.) Semester-VI (C.B.S.) Examination**

**OPERATIONS RESEARCH**

**Paper-1 (Statistics)**

Time : Three Hours]

[Maximum Marks : 50

**N.B. :— ALL** questions are compulsory and carry equal marks.

1. (A) What is a network ? State and define components of a network. Also state the rules for drawing network and also state Fulkersons rule for numbering events. 10

**OR**

- (E) Explain forward and backward pass calculations. How is critical path determined with the help of these calculations ? 10

2. (A) For the following primal problem :

$$\begin{aligned} \text{Maximize} \quad & Z = 3x_1 + 4x_2 \\ \text{subject to} \quad & 4x_1 + 2x_2 \leq 80 \\ & 2x_1 + 5x_2 \leq 180 \\ & x_1, x_2 \geq 0 \end{aligned}$$

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Write its dual & hence show that dual of the dual is primal.

- (B) If the primal problem is a maximization problem then show that the value of the objective function for any feasible solution to the primal is always smaller than or equal to the value of the objective function of dual for any feasible solution of the dual. 5

**OR**

- (E) Define direct, indirect and total cost of a project. How are these costs related to the duration of activity? Discuss the steps involved in time-cost optimization analysis. 10

3. (A) Prove that the necessary and sufficient condition for transportation problem to have feasible solution is that it should be balanced. 5

- (B) Discuss north-west corner rule for determining the basic feasible solution to a transportation problem. When will the solution be degenerate ? 5

**OR**

- (E) Having obtained the initial basic feasible solution, write algorithm of MODI method for obtaining optimal solution to a transportation problem. 10

4. (A) Define two person zero sum game. Show that the payoff ( $\underline{v}$ ) corresponding to maximin strategy is always less than or equal to payoff ( $\bar{V}$ ) corresponding to minimax strategy. State the condition for such a game to be (i) strictly determinable & (ii) fair.

Determine the range of value of  $p$  and  $q$  that will make payoff element  $a_{22}$  a saddle point for the game whose payoff matrix  $(a_{ij})$  is given below.

$$\begin{array}{c} \text{Player B} \\ \text{Player A} \begin{pmatrix} 2 & 4 & 7 \\ 10 & 7 & q \\ 4 & p & 8 \end{pmatrix} \end{array} \quad 10$$

**OR**

- (E) Explain an assignment problem. Represent it as an LPP. State and prove reduction theorem. 10

5. Solve any **ten** of the following questions :

- (A) If the total float for a certain activity is zero, what will be the value of free float and independent float ?
  - (B) What is the probability of completing the project before expected project duration ? Justify your answer.
  - (C) Which measure of central tendency, does most likely time correspond to ?
  - (D) What are symmetric primal-dual pair ?
  - (E) Define cost-slope of an activity.
  - (F) Which activities are never crashed for reducing project duration ?
  - (G) What is an unbalanced transportation problem and how is it balanced ?
  - (H) State the total number of constraints involved in an  $(m \times n)$  transportation problem, when expressed as an LPP.
  - (I) When will there be an alternative optimal solution to a transportation problem ?
  - (J) Is a fair game always strictly determinable ? Is the converse true ?
  - (K) What is a strategy in 'games'?
  - (L) What is a saddle point ?
- 10×1=10