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

OPERATIONS RESEARCH

(Statistics)

Paper—1

Time : Three Hours] [Maximum Marks : 50

Note :— All questions are compulsory and carry equal marks.

1. (A) State the rules for drawing network diagram.

(B) Distinguish between PERT and CPM. Define the three time estimates in PERT analysis. Also define expectation and variance of activity duration. 5+5

OR

(E) Define earliest and latest times of an activity. Also define float of an activity. Discuss various types of float. 10

2. (A) Define a dual of a primal problem. Compare the characteristics of primal and dual problem. Let the primal problem be :

Max. $z_x = cX$

s.t. $AX \leq b$, and $X \geq 0$.

(i) Show that dual of a dual is primal.

(ii) Let X^* be any feasible solution to the primal and let Y^* be any feasible solution to its dual. Then, show that $cX^* \leq b'Y^*$.

If $cX^* = b'Y^*$, then show that X^* and Y^* are the optimal solutions to the primal and dual problems respectively. 10

OR

(E) Discuss time-cost trade-off analysis. 10

3. (A) Explain the North-West Corner rule of getting initial basic feasible solution to a transportation problem. Explain the stepping stone method of getting an optimal solution to a transportation problem. 10

OR

(E) Write the transportation problem as an LPP and write its dual problem. Give the steps of MODI method of getting an optimal solution to a transportation problem. 10

4. (A) Explain the following terms :

(i) Strategy

(ii) Pure and mixed strategy

(iii) Optimum strategy

(iv) Two-person zero-sum game

(v) Maximin and minimax strategies

(vi) Value of the game.

Comment on the statement : 'The maximin value of a game is 7 and minimax value is 5.' Justify your answer. 10

OR

(E) Write assignment problem as an LPP. Explain Hungarian method of solving assignment problem. In maximization problem, how is Hungarian method used ? 10

5. Answer any ten of the following questions :

(A) Which type of float will always remain available for completion of an activity ?

(B) In PERT, the sum of variances of activities along three critical paths are found to be 81, 125 and 100, what will be the variance of project duration ?

(C) Define an event slack.

(D) Comment on the status of i^{th} dual variable when the i^{th} constraint in the primal is an equation.

(E) If Max Z = CX and Min Z = b^TW are objective functions for primal and dual respectively, then state the necessary and sufficient condition for feasible solutions X_0 and W_0 of primal and dual to be optimal solution.

(F) For primal Max Z = CX, the optimal value attained is 2016, what will be the optimal value attained by dual objective Minimize Z* = b^TW ?

(G) If a constant K is added to each cost element Cij, then how will the total cost of transportation be affected ?

(H) If a constant is added or subtracted from each cost element, then how will the optimal solution be affected ?

(I) For an unoccupied cell (1, 5) of a transportation problem the closed path or loop is X = {(1, 5), (3, 5), (3, 3), (2, 3), (2, 1), (1, 1)} if the respective allocation to the last five cells in order are 12, 8, 16, 10 and 9, determine the maximum allocation that can be made to obtain new basic feasible solution.

(J) What is necessary and sufficient condition for existence of saddle point ?

(K) The basic feasible solution to an assignment problem is degenerate. Comment.

(L) In an assignment problem involving 'n' resources and 'n' activities, how many non-zero basic variables are there ? 10×1=10