NRJ/KW/17/3183

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) Distinguish between PERT and CPM. Also, give an example each where PERT and CPM can be used for project management. Define the three time estimates of an activity and explain how to find the probability of project completion by a scheduled data. 10

OR

(E) State the rules of network construction. What is a dummy activity ? Differentiate between identity dummy and logic dummy with the help of an example.

(F) Write a short note on total float and free float of an activity. 5+5

2. (A) Write a dual of an LPP in canonical form. Prove that :

(i) The dual of a dual is a primal.

(ii) If either the primal or the dual problem has an unbounded solution then the other problem has no feasible solution.

(B) Explain the costs associated with a project. Define cost slope and explain its use in crashing a project. 5+5

OR

(E) Compare the characteristics of primal and dual problems. Write the dual of a standard LPP. Give the economic interpretation of a primal problem.

(F) What is meant by time-cost trade-off analysis ? Give the steps in time-cost trade-off analysis. 5+5

3. (A) Write transportation problem as an LPP. Define (i) feasible solution, (ii) basic feasible solution and (iii) non-degenerate basicfeasible solution to the transportation problem.

Explain North-West corner rule and Least cost method of finding the basic feasible solution to a transportation problem. 10

OR

(E) Explain column minima method for finding initial basic feasible solution and MODI method for getting the optimal solution to a transportation problem. What changes are necessary if the transportation problem is maximization problem ? 10

4. (A) Explain an assignment problem and show how it can be written as an LPP. Explain why the following methods can not be used for solving the assignment problem :

(i) Enumeration method

(ii) Simplex method

(iii) Transportation method.

Hence, state the steps of solving it by Hungarian method. 10

OR

(E) Define a competitive game. Give two situations where theory of games can be applied. Define a two-person zero-sum game. Explain the following terms in the context of a two-person zerosum gam :

(i) Player

(ii) Strategy

(iii) Payoff of a strategy

(iv) Optimal strategy

(v) Pure strategy

(vi) Mixed strategy

(vii) Payoff matrix.

Explain the minimax and maximin principle. Hence define a saddle point and the value of the game. State the rules to determine the saddle point. 10

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

(A) Define critical path in a network.

(B) What is dangling and looping in a network ?

(C) What is a merge event and burst event in a network ?

(D) Give the statement of complementary slackness theorem.

(E) Write the dual of the following primal :

Min. $z = 3x_1 - 2x_2 + x_3$

St.

$2x_1 - 3x_2 + x_3 \leq 5$

$4x_1 - 2x_2 \leq 9$

$-8x_1 + 4x_2 + 3x_2 = 8$

$x_1, x_2, x_3 \geq 0.$

(F) If there are more than one critical path in a network, then what care should be taken while crashing the network ?

(G) How is an unbalanced transportation problem converted in balanced problem ?

(H) State the condition for an alternate optimal solution to a transportation problem.

(I) Define optimal solution to the transportation problem.

(J) When does an assignment problem have an alternative optimal solution ?

(K) In a two-person zero-sum game, write the payoff matrix of player A. Why is it not necessary to construct payoff matrix for player B ?

(L) If an assignment problem is profit maximization problem, then how can it be converted into a minimization problem ? 1×10