D3AST2003 (2 Pages) Name.............................
Reg. No ……………......

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2021
(Regular/Improvement/Supplementary)

STATISTICS
FMST3E01 – OPERATIONS RESEARCH

Time: Three Hours **Maximum Weightage: 30**

Part A: *All* questions can be answered. Each carries *two* weightage (Ceiling 6 weightage).

1. Define slack and surplus variables associated with an LPP. If a slack variable can be introduced with every constraints of the problem, how it will help us in the simplex procedure?
2. Define a convex set. Show that set of feasible solution to a linear programming problem is a convex set.
3. Define a transportation problem and an assignment problem. Explain how an assignment problem can be treated as a particular case of a transportation problem.
4. Define minimax and maximin value of a game. What do you mean by a saddle point? Give an example of a game with saddle point and without saddle point.
5. Describe the essence of Gomery’s cutting plane algorithm in solving an integer programming problem.
6. Explain the problem of maximal flow. Discuss the role of “cuts” in solving such a problem with the help of an example.
7. State and prove a sufficient condition for a stationary point x_0 to be an extremum of function.

Part B: *All* questions can be answered. Each carries *four* weightage (Ceiling 12 weightage).

8. Describe a revised simplex method. What are its advantages over usual simplex method?
9. Explain Hungarian algorithm of solving an assignment problem.
10. What you mean by a loop in a transportation table. What are its role in solving a transportation problem?
11. Explain in detail how will you solve a 2X2 game algebraically.
12. Show that for a probabilistic inventory model with instantaneous demand and no set up cost, the optimal stock level Z can be obtained by

$$\sum_{d=0}^{z-1} P(d) \leq \frac{p}{p+h} \leq \sum_{d=0}^{z} P(d)$$

Where p is the shortage cost, h is the holding cost and $P(d)$ is the pmf of demand.

13. Describe and analyze a multi-item EOQ with storage limitation.
14. Minimize $Z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3$

    Subject to $x_1 + x_2 + x_3 = 11$

    $$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$$

    By forming the Legrangian Function.

Part C: ***All*** **questions can be answered. Each carries** ***six*** **weightage (Ceiling 12 weightage).**

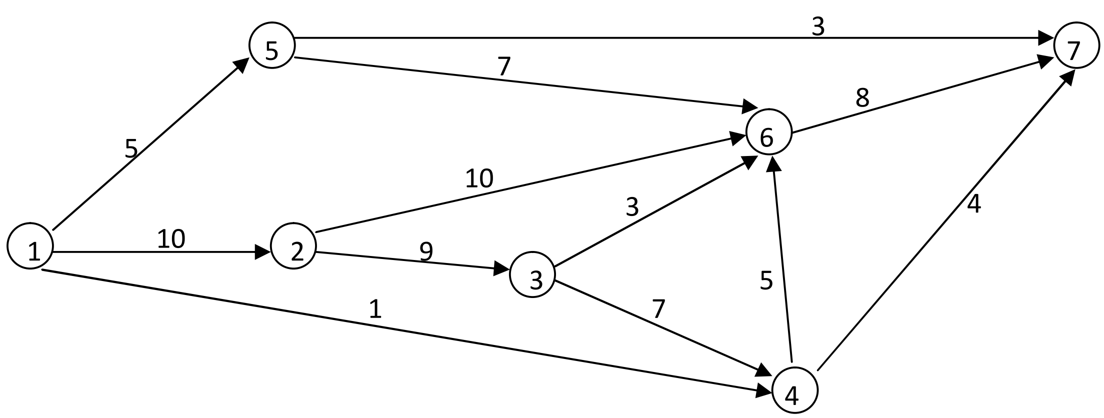
15. Define net evaluation associated with an LPP. Establish its role in improving and identifying optimum feasible solution. Also explain how multiple optimum solution can be detected.
16. a) Describe the Vogel's approximation method of finding an initial solution to a transportation problem.

    b) Solve the T.P.

11	13	17	14	250
16	18	14	10	300
21	24	13	10	400
200	225	275	250	

17. a) Given a project network. Explain how the critical path can be obtained using forward and backward pass calculations.

    b) Find the critical path for the following network



18. a) Define a quadratic programming. Explain how Kuhn-Tucker condition can be used to solve it.

    b) Solve the quadratic programming problem.

    Maximize $Z = 2x_1 + 3x_2 - 2x_1^2$

    Subject to $x_1 + 4x_2 \leq 4$

    $x_1 + x_2 \leq 2$

    $x_1 \geq 0, x_2 \geq 0$