D3AST2203 **(2 Pages)** **Name.....**
Reg.No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2023
(Regular/Improvement/Supplementary)
STATISTICS
FMST3E01 - OPERATIONS RESEARCH

Time: 3 Hours **Maximum Weightage: 30**

Part A: Answer any *four* questions. Each carries *two* weightage.

1. Explain the terms in context of LPP: (i) Non-negativity constraints; (ii) Optimum basic feasible solution; (iii) Degeneracy.
2. What is sensitivity analysis and why do we perform it?
3. Describe cutting plane method of solving an all-integer linear programming problem.
4. Explain the difference between a transportation problem and an assignment problem.
5. Write a short note on applications of non-linear programming problem.
6. Explain the EOQ with price breaks.
7. Describe a procedure to determine a minimal spanning tree for a given set of nodes and potential links.

(4 × 2 = 8 weightage)

Part B: Answer any *four* questions. Each carries *three* weightage.

8. Prove that if an LPP has a feasible solution, then it also has a basic feasible solution.
9. Describe the branch and bound method for the solution of integer programming problem.
10. Explain direct search method of non linear programming algorithms for the unconstrained problem.
11. Prove that the dual of the dual of a given primal is again primal.
12. Solve the following 2x2 game graphically:

	Player B			
Player A	B_1	B_2	B_3	B_4
A_1	2	1	0	-2
A_2	1	0	3	2

13. Briefly explain the algorithm to solve Shortest Route Problem.

(P.T.O.)

14. Electra uses resin in its manufacturing process at the rate of 1000 liters per month. It cost Electra $100 to place an order. The holding cost per liter per month is $2 and the shortage cost per liter is $40. Previous data shows that the demand during lead time is uniform in the range (0,100) liters. Determine the optimal ordering policy for Electra.

(4 × 3 = 12 weightage)

Part C: Answer any *two* questions. Each carries *five* weightage.

15. Use Big M method to

$$\text{Maximize} \quad Z = x_1 + 2x_2 + 3x_3 - x_4$$
$$\text{Subject to} \quad x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 = 20$$
$$x_1 + 2x_2 + x_3 + x_4 = 10$$

x_1, x_2, x_3, x_4 are all non-negative integers.

16. (a) Explain Vogel's method of finding an initial basic feasible solution to a transportation problem. Explain the u-v method of improving it.

(b) Solve the following assignment problem.

Person\Job	1	2	3	4
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

17. Use separable convex programming to solve the NLPP :

$$\text{Maximize} \quad f(x) = 3x_1 + 2x_2$$
$$\text{Subject to} \quad g(x) = 4{x_1}^2 + {x_2}^2 \leq 16$$
$$x_1, x_2 \geq 0.$$

18. A project has the following characteristics.

Activity	Optimistic time	Pessimistic time	Most likely time
1-2	1	5	1.5
2-3	1	3	2
2-4	1	5	3
3-5	3	5	4
4-5	2	4	3
4-6	3	7	5
5-7	4	6	5
6-7	6	8	7
7-8	2	6	4
7-9	5	8	6
8-10	1	3	2
9-10	3	7	5

(i) Construct a PERT network and find critical path and variance for each activity.
(ii) What is the probability that the project will be completed within 35 days.

(2 × 5 = 10 weightage)