

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2022
(Regular/Improvement/Supplementary)

STATISTICS
FMST3E01 - OPERATIONS RESEARCH

Time: 3 Hours

Maximum Weightage: 30

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

1. Define the terms: (i) Basic feasible solution; (ii) Degenerate basic solution; (iii) Optimum basic feasible solution.
2. Distinguish between 'Big- M' method and two phase method for solving LPP. Explain 'Big -M' method for solving a Linear Programming Problem.
3. Describe the branch and bound method for the solution of integer programming problem.
4. Explain the Maximin and Minimax principle used in Game theory.
5. Write the iterative procedure for solving a separable NLPP.
6. Describe briefly the EOQ concept. What are its limitations?
7. Briefly explain an algorithm to solve Shortest Route Problem.

(4 × 2 = 8 weightage)

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

8. State and prove the fundamental theorem of linear programming.
9. Prove that the dual of the dual of a given primal is again primal.
10. Describe cutting plane method of solving an all-integer linear programming problem.
11. Give in detail the computational procedure of solving the assignment problem.
12. Derive the Kuhn- Tucker conditions for an optimal solution to a quadratic programming problem.
13. Briefly explain Probabilistic EOQ models.
14. Describe a procedure to determine a minimal spanning tree for a given set of nodes and potential links.

(4 × 3 = 12 weightage)

(P.T.O.)

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

15. Solve the following integer linear programming problem using the cutting-plane method:

$$\text{Maximize } Z = 3x_1 + x_2 + 3x_3$$

$$\begin{aligned} \text{Subject to } & -x_1 + 2x_2 + x_3 \leq 4 \\ & 4x_2 - 3x_3 \leq 2 \\ & x_1 - 3x_2 + 2x_3 \leq 3 \end{aligned}$$

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

16. Solve the nonlinear programming problem:

$$\text{Optimize } Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$$

$$\text{Subject to } x_1 + x_2 + x_3 = 15, 2x_1 - x_2 + 2x_3 = 20; x_1, x_2, x_3 \geq 0$$

17. Use two-phase simplex method to

$$\text{Maximize } Z = 5x_1 - 4x_2 + 3x_3$$

$$\begin{aligned} \text{Subject to } & 2x_1 + x_2 - 6x_3 = 20 \\ & 6x_1 + 5x_2 + 10x_3 \leq 76 \\ & 8x_1 - 3x_2 + 6x_3 \leq 50 \end{aligned}$$

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

18. A project has the following characteristics

Activity	Immediate Predecessor	Optimistic time	Pessimistic time	Most likely time
A	-	1	7	1
B	-	1	7	4
C	-	2	8	2
D	A	1	1	1
E	B	2	14	5
F	C	2	8	5
G	D,E	3	15	6
H	F,G	1	3	2

(i) Construct a PERT network and find out the expected project completion time.

(ii) What duration will have 95% confidence for project completion?

(2 × 5 = 10 weightage)