Semester 5

Core Course (Major)

Course Code: 5MTMMJC3 (Credit: 4, Hours: 60; Full Marks: 100)

Course Name: Linear Programming Problem and Laplace Transformation

Marks and Credit distribution:

Theory: 3 Credits, Tutorial: 1 Credit

End Semester exam: 50 Marks, Continuous Assessment: 20 Marks, Attendance: 5 Marks, Tutorial: 25 Marks

Course Outcome: Upon successful completion of this course, students will be able to formulate and analyze linear programming problems using concepts such as basic feasible solutions, convexity, duality, and the simplex method. They will apply optimization techniques to solve transportation, assignment, and traveling salesman problems. Additionally, students will use Laplace transforms to solve ordinary differential equations, strengthening their analytical skills in operations research and applied mathematics.

Course Content:

Group A: Linear Programming Problem

(Marks assigned for end semester: 38, 45 Hours)

1. Basic solutions and Basic Feasible Solution (BFS) with reference to L.P.P. Degenerate and Non-degenerate B.F.S.

2. Hyperplane, Convex set, Extreme points, Convex hull and Convex polyhedron. Supporting and Separating hyperplane. The collection of all feasible solutions of an L.P.P. constitutes a convex set. The extreme points of the convex set of feasible solutions correspond to its B.F.S. and conversely. The objective function has its optimal value at an extreme point of the convex polyhedron generated by the set of feasible solutions. If the L.P.P. admits of an optimal solution then at least one B.F.S. must be optimal. Reduction of a F.S. to a B.F.S.

3. Slack and Surplus variables. Standard from of L.P.P. theory of simplex method. Feasibility and optimality condition.

4. Two phase method. Degeneracy in L.P.P. and its resolution.

5. Duality theory: The dual of the dual is the primal. Relation between the objective values of dual and the primal problems. Relation between their optimal values. Duality and simplex method and their applications. Sensitivity Analysis.

6. Transportation and Assignment problems. Mathematical justification for optimality criterion. Hungarian method. Traveling Salesman problem.

Note: Illustrative examples from Real life problems desirable.

References

[1] Linear Programming : Method and Application – S. I. Gass.
[2] Linear Programming – G. Hadley.
[3] An Introduction to Linear Programming & Theory of Games – S. Vajda.
[4] An Introduction to L. P. P. and Game – Ghosh and Chakravarty.
[5] Linear Programming- P. M. Karak.
[6] Operations Research: An Introduction: Hamdy. A. Taha

Group B: Laplace Transformation

(Marks assigned for end semester: 12, 15 Hours)

Laplace Transform and Inverse Laplace Transform. Statement of Existence theorem. Elementary properties of Laplace Transform and its Inverse. Laplace Transform of derivatives. Laplace transform of integrals. Convolution theorem (Statement only). Application of Laplace Transformation in ordinary differential equation.

References

[1] Advanced Differential Equations – M.D. Raisinghania.

[2] Differential equations – S.L. Ross
[3] Schaum's Outline of Laplace Transforms – Murray Spiegel
[4] The Use of Integral transforms: Ian. N. Sneddon