APPLIED MATHEMATICS

Integral Transform:
Laplace Transform and Inverse Laplace Transform, Fourier Transform, Fourier Sine and Cosine Transform, Complex Fourier transform, Inversion formulae, linearity property, Change of scale property and shifting property, Fourier transform of derivatives, Parseval's identity. Application of Laplace and Fourier Transform, Definitions of Hankel transform, Mellin Transform, and their elementary properties.

Fourier Series & Vector Calculus:
Fourier Series: Euler's Formulae, Dirichlet's Conditions, Fourier Series for Continuous and Discontinuous Functions, Half-Range Fourier Series.
Vector Calculus: Gradient, Divergence & Curl, Vector Differentiation, Vector Integration (Line, Surface & Volume), Gauss-Divergence, Stoke's & Green Theorem.

Differential Equations:
Ordinary Differential Equations: Differential Equation of First Order and First Degree , first order and Higher degree , Linear Higher order Differential Equation with Constant Coefficient, Homogeneous Linear Differential Equations, Simultaneous Differential Equations.
Partial Differential Equation: Linear Partial Differential Equation of First Order, Non-Linear Partial Differential Equation of First Order, Homogeneous Linear PDE with Constant Coefficients, Application of Partial Differential Equations.

Numerical Analysis:
Error and Approximations, Solution of Algebraic and Transcendental Equations, Interpolation for equal and unequal intervals, Inverse interpolation. Numerical Integration and Numerical Differentiation, Numerical Solution of Simultaneous linear equations, Solution of ordinary differential equation using Numerical Methods.

Operations Research:
Introduction to Linear Programming, Solution by Graphical and Simplex Method, Concept of Degeneracy and Duality, Optimal Solution of Transportation Problems, Assignment Problems, Job Sequencing Problems.

Functions of Complex Variable:

Complex Function, Continuity, Differentiability, Analytic Function, Complex Integration, Cauchy's Integral Theorem, Cauchy's Integral Formula, Zero's & Poles, Complex Sequence, Series and Power, Taylor's and Laurent Series. Residue (Definition), Residue Theorem, Evaluation of Real Integral, Conformal Mapping.

Probability & Statistics:
Probability, Distributions (Binomial, Poisson, Normal), Random variables, Distribution function, Probability density function, Expectation, Moments, Moment generating

function, Test of Hypotheses, Level of significance, Small and Large sampling, Chi-Square test.

Coefficient of variance, standard error, standard deviation, and correlation and regression analysis. Student t-test, F-test, analysis of variance (ANOVA), data graphics and data interpretation. Principles and various models of statistical optimization techniques, optimization softwares.

Functional Analysis:
Normed spaces: Basic definitions & properties, Examples of normed spaces, Banach space, Factor space as Banach space, Convergence and absolute convergence, Necessary and sufficient condition for completeness of a normed linear space, Linear operator, properties of linear operators, Dual space.

Linear Algebra:
Group, Sub group, co-sets, normal Sub group, Semi group, Ring and Fields, Vector spaces, Vector subspaces, Linear dependence and independence, Bases & Dimension, Linear transformations, The Algebra of linear transformation, Rank of a Linear transformation, Characteristic roots, Relation between characteristic roots and characteristic vectors. Metric Space.

Graph Theory:
Definitions, Sub Graph, Finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex, Null Graph, Isomorphism, Sub graphs, Walks, Path and Circuits, Connected & Disconnected Graph, Components, Euler Graph, Operation of Graphs, Hamiltonian Path and Circuit. Tree, Decision, Rooted, Binary, Spanning Trees, Properties of trees.

Research Aptitude
National and international scenario of scientific research, literature reviewing, reference citation, scientific and research journals, impact valuation, research article and patent drafting, various scientific websites, abstracting services.