Syllabus for PhD Admission Test – 2026-27

Mathematics

Linear Algebra:

Vector spaces, subspaces, linear dependence, basis and dimension. Linear transformation, range space, null space, rank and nullity. Matrix representation of a linear transformation. Change of basis. Eigenvalues and eigenvectors. Inner product, orthogonality, Gram-Schmidt process, orthogonal expansion. Quadratic forms, reduction to normal form.

Analysis:

The real number system. Sequences, series and uniform convergence. Continuity and differentiability of functions of real variables. Riemann and Lebesgue integrals. Metric spaces. Cauchy sequences and convergence. Completeness. Normed space. Banach space. Inner product space. Hilbert space.

Analytic function, Mobious Tranformation, Cauchy Riemann equations, Cauchy's theorem and integral formula, singularities, Taylor's and Laurant's series. Cauchy's residue theorem.

Differential Equations:

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations. Second order linear differential equations. Variation of parameters. Systems of linear equations. Solution by matrix method, Sturm-Liouville problem. First and second order partial differential equations. Method of separation of variables for Laplace, heat and wave equations.

Mathematical Methods:

Laplace Transform, Fourier Transform, Fourier Integrals and series, Legendre Polynomials, Bessel Functions

Probability and Statistics:

Sample space, events and probability axioms. Random variable and probability distributions. Mean and Variance. Binomial, normal and Poisson distributions. Random sampling, confidence intervals, testing hypotheses, goodness of fit. Regression.