SYLLABUS OF WRITTEN TEST FOR RECRUITMENT TO THE POST OF SCIENTIST/ENGINEER 'SC'
ADVERTISEMENT NO.: सैक SAC: 01:2026, Dated 23.01.2026

DOMAIN: STATISTICS / MATHEMATICS/ APPLIED MATHEMATICS
Post Code – 13

Linear Algebra

Finite dimensional vector spaces over real or complex fields; Linear transformations and their matrix representations, rank and nullity; systems of linear equations, characteristic polynomial, eigenvalues and eigenvectors, diagonalization, minimal polynomial, Cayley-Hamilton Theorem, Inner product spaces, Gram- Schmidt orthonormalization process, Hermitian, Normal, Orthogonal and Unitary matrices; Matrix-diagonalization and primary decomposition theorem, Jordan canonical form, generalized eigen vectors; bilinear and quadratic forms.

Calculus and Vector Calculus

Functions of two variables, Continuity, Differentiability, Directional derivatives, Critical points, Mean value theorem, Taylor series, Double and Triple integrals and their applications to area, volume and surface area; Gradient, Divergence and Curl, Line/Surface/Volume integrals, Green's theorem, Stokes' theorem, and Gauss divergence theorem

Real and Complex Analysis

Metric spaces, Sequences and series of functions, uniform convergence, Compactness & Completeness, Ascoli-Arzela theorem; Contraction mapping principle, Power series; Differentiation of functions of several variables, Functions of a complex variable, Analytic functions, Harmonic functions, Conformal mapping, Complex Integral and Cauchy Integral Formula, Taylor and Laurent Series, Zeros and Singularities, Residue Theorem

Numerical Analysis

Systems of linear equations, Matrix decompositions: LU, LR, LL*(Cholskey), QR, Polar decomposition, Gauss-Seidel and Jacobi Methods, Numerical solutions of nonlinear equations: bisection method, Secant method, Newton-Raphson method; Lagrange Interpolation, Numerical integration: Trapezoidal and Simpson rules; Numerical solution of initial value problems for ordinary differential equations: Euler's and Runge-Kutta methods.

Fourier Series and Transform

Fourier series, Convergence/Divergence of Fourier series, Fourier Transform of Integrable functions, Fourier transform of standard functions: Exponential, Sinusoidal and Sinc/Ract etc.,

Probability and Statistics

Axiomatic definition of probability, Properties of probability function, Conditional probability, Bayes' theorem, Independence of events; Random variables and their distributions, Distribution function, Probability density function and their properties, Expectation, Moments and moment generating function. Bernoulli, Binomial, Uniform, Normal, Poisson, Exponential, Gamma distributions, Testing of hypothesis: t, chi squared and F tests, Confidence intervals, Linear regression.

Ordinary and Partial Differential Equations

System of Linear/Nonlinear first order ordinary differential equations, existence and uniqueness theorems for initial value problems, method of Laplace transforms for solving ordinary differential equations, Stability theory and Lyapunov functions, Series-Solution and Special Functions (Legendre & Bessel), First order linear and quasi-linear partial differential equations, Heat and Wave Equation in one variable

Measure Theory and Integration

Inner and Outer measure on R, Lebesgue measure on **R,** Measurable and non-measurable sets, Reimann and Leabsgue Integral on R, Fatou Lemma, Monotone/Bounded/Lebesgue convergence Theorem,

Functional Analysis

Normed linear spaces, Banach spaces, Hahn-Banach theorem, open mapping and closed graph theorems, principle of uniform boundedness; Inner-product Spaces, Hilbert spaces, orthonormal bases, Projection theorem, Closest point in closed convex sets, Bessel's inequality, Parseval's identity, The Riesz representation theorem

Abstract Algebra

Groups, subgroups, Normal subgroups, Quotient groups, Homomorphisms, Automorphisms; Cyclic groups, Permutation groups, Group action, Sylow's theorems and their applications; Rings, Ideals, Field and Finite Fields

Dynamics and Orbital Mechanics

Introduction to the law of Kepler and Newton, Motion of rigid bodies, Fundamental problem associated with two body problem, Orbital elements, Elemental theory of satellite orbits.

Optimization Techniques

Constrained and Unconstrained optimization, Method of Lagrange Multipliers, KKT conditions, Optimization methods: Newtons Method, Gauss-Newton Method, Method of steepest descent, Levenberg-Marquardt method, Convex optimization

Hindi version shall follow.