



Shri Sangameshwar Education Society, Solapur

Kannada Linguistic Minority Institute

Sangameshwar College, Solapur

(Autonomous)

The Written Test – the First Phase of the Selection Process
for the Post(s) of Assistant Professor

Syllabus

Subject: Mathematics

Unit1: Differentiation:

Successive differentiation-nth order derivatives of standard functions and Leibnitz rule with applications. Partial Differentiation: Limits and Continuity of functions of two and three variables, Partial derivatives of higher orders. Composite Rules, and Euler's theorem on Homogeneous functions with applications. Vector differentiation: Gradient, divergence and curl.

Unit2: Differential and Integral Calculus:

Differential Calculus: Definition of Curvature, Radius of curvature, Cartesian, Parametric and Polar Equations, Pedal Equations. Jacobians, Maxima and minima, extreme values and Lagrange's Method of undetermined multipliers of two and three variables. Integral Calculus: Improper integrals, Beta and Gamma function, Double Integrals (Cartesian and polar), Applications of Double integration (area of regions and volume of a solid only), and Change of order of integration.

Unit3: Differential Equations:

ODE: Exact differential equations and Integrating factor, Linear Differential equations with constant coefficients, Linear Equations of the second order (complete solution when one integral is known, Removal of the First order Derivative and change of independent variable). PDE: Linear PDE of order one (Formation of PDEs, Classification and Lagranges method), Non-linear PDE of order one (CI, PI, SI and GI with usual meanings and Charpit's method with examples).

Unit4: Algebra:

Abstract Algebra: Groups and Subgroups (Permutation, Cyclic, Cosets, Lagrange and Cayley theorems), Equivalence, Congruence, Divisibility with Eulers Phi Function, Properties of isomorphic groups Cayley's theorem with numerical problems, Homomorphism of Groups, Kernels, normal subgroups, Quotient Groups, and the Fundamental theorem of Homomorphism. Ring, and integral domains (Definition, properties and examples only). Linear Algebra: Rank of a matrix (Normal/Echelon forms), finding inverse of a matrix using Cayley-Hamilton theorem, Eigen values and eigen vectors. Vector Spaces, subspaces, linear combination and system of linear equations. Linear dependence and independence, basis and dimensions. Linear transformation, null spaces and range. Matrix representation, composition and matrix multiplication of linear transformation, Inner products and Norms. Ortho-normalization Gram Schmidt process.

Unit5: Real Analysis:

Functions, Real Valued functions, Equivalence, and countability. Sequence and subsequence (Limits, convergence, divergence, Bounded and monotone of a sequence, limit superior and inferior and Cauchy sequence). Series of real numbers, tests for absolute convergence (Comparison test, Ratio test and Root test), Cauchy condensation test and Pringshiems theorem.

Unit6: Metric Spaces:

Definition, examples on metric spaces and Limits in metrics paces. Operations on limits, and Cauchy Sequences. Open ball/sphere, Examples, Function continuous on a metric space, Proofs of the various theorems using open ball definition. Open Sets and Closed Sets. Bounded and totally bounded sets, complete metric spaces.

Unit7: Integral Transforms:

Laplace and inverse Laplace transforms, Applications of Laplace Transforms.

Unit8: Complex Analysis:

Analytic function, C-R equations, Method of constructing a regular function and analytic function, Simple method of constructing analytic function, Polar form of Cauchy-Riemann Equations. Taylor's Maclaurin's and Laurent's Series [Statement only]) and its examples. Zeros, residues, poles and singularities, Cauchy's Residue Theorem. Evaluation of Definite integrals).

Unit9: Teaching Methodology and NAAC