

# 1. Mohan Lal Sukhadia University, Udaipur

## SYLLABUS FOR SCREENING TEST FOR THE POST OF ASSISTANT PROFESSOR MATHEMATICS

**1 Advanced Abstract Algebra :** Groups – Normal Sub-groups, Quotient groups, Homomorphism, Isomorphism of groups. Class equation for finite groups. Cauchy's Theorem for finite obelion groups, P-groups, Solvable groups, Jordan Holder Theorem, Nilpotent groups, Ring morphism, Principal Ideal domain, Euclidean Rings, Polynomial rings, Modules, Sub modules, Quotient modules, Simple modules, Semi-simple modules and Free modules.

### **2 Real Analysis :**

Continuity, uniform continuity, Differentiability, Mean value theorems, Sequence and Series, Uniform Convergence, Riemann Integral, Measurable sets, Lebesgue outer measure, Borel and Lebesgue measurability, Non measurable sets, Countable and Non countable sets.

### **3 Complex Analysis :**

Analytic Functions, Cauchy's Theorem, Cauchy's Integral Formulae, Power Series, Laurent's Series, Singularities, Theory of Residues, conformal mappings, Fractional and Bilinear Transformations, Meromorphic Functions, The Residue Theorem, Contour Integration.

### **4 Special Functions and Integral Transforms :**

Beta and Gamma Functions, Hypergeometric Functions, Bessel Functions, Legendre Polynomials, Hermite Polynomials, Laguerre Polynomials, Laplace transform of elementary functions, Inverse Laplace transform, convolution theorem, Fourier transform and its application to ordinary and partial differential equations.

### **5 Functional Analysis :**

Metric Spaces, complete metric spaces, Cantor's Intersection theorem, Baire's Category theorem, Fixed Point theorem, Normed Vector Spaces, Banach Spaces, Continuous Linear transformations, Inner Product spaces, Hilbert spaces.

### **6 Differential and Integral Equations :**

Existence and Uniqueness of solution of  $dy/dx = f(x,y)$ , Green's Functions, Sturm-liouville Boundary value Problems, Cauchy's problems and characteristics, classification of second order P.D.E. Linear Integral equations of first and second kind of fredholm and Volterra type. Solution by successive substitutions and successive approximations. Solution of equations with separable Kernels.

### **7 Topology :**

Topological spaces, closed sets, closure, Deuse subsets, Neighbourhood. Interior, exterior and boundary, Accumulation points and derived sets. Bases and sub-bases. First and second countable spaces, separable spaces, Separation axioms, compactness, continuous functions and compact sets, connected spaces.

### **8 Linear Algebra :**

Vector Spaces, Linear dependence and independence, Base's, Dimensions, Linear transformations, Matrix representation, Algebra of Matrices, characteristic roots and vectors, change of base, system of linear equations, Determinants, Cayley-Hamilton theorem.

### **9 Numerical Analysis :**

Interpolation-Difference schemes, divided difference Lagrange interpolation.  
Solution of Equations – Bisection secant, Regula-Falsi and Newton's methods, Roots of a polynomial.  
Linear Equation-Direct methods (Jacobi, Gauss, Siedal and Relaxation method)  
Numerical Differentiation and integration.

### **10 Mathematical Programming :**

Theory of Simplex method, Simplex algorithm, Duality, Degenaracy, Transportation and Assignment problems, Game Theory – Two person Zero sum game, Games with mixed strategies. Integer programming.

Note:- Pattern of Question Paper

1. Objective type paper
2. Maximum Marks :100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All questions carry equal marks

There will be Negative Marking