

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER
SYLLABUS FOR SCREENING TEST FOR THE POST OF LECTURER IN
MATHEMATICS
FOR TECHNICAL EDUCATION DEPARTMENT

1. Algebra:

- (i) Different kinds of sets and their basic properties, Relations, type of relations, functions and type of functions, composite functions.
- (ii) Groups and their properties, order of an element, order of a group, permutation groups, cyclic groups and their properties, subgroups and their properties, co-sets and their properties, homomorphism and isomorphism, Normal sub group.

2. Matrix and determinants:-

- (i) Various type of matrices, their basic operations and properties, invertible matrices and their inverse.
- (ii) Determinant and their properties, solution of system of linear equations in two or three variables using inverse of a matrix.

3. Linear Algebra:-

Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Algebra of matrices, rank and determinant of matrices, linear equations. Eigen values and Eigen vectors, Cayley-Hamilton theorem.

4. Calculus

- (i) Increasing and decreasing function, tangents and normals, maxima and minima of functions of one and two variables Curvature, Asymptotes, Partial Differentiation, Euler's theorem, envelopes and evolutes.
- (ii) Beta-Gamma functions, double and triple integrals, quadrature, rectification, surfaces and volumes.

5. Analysis:-

- (i) Limit, continuity and differentiability, mean value theorems, various tests of convergence of sequence and series, Riemann integration.
- (ii) Metric space, complete metric space, connectedness and compactness.

6. Complex Analysis:

- (i) Complex numbers and their algebraic properties, polar representation, square root of a complex number. Application in finding the roots of the equation.
- (ii) Continuity and differentiability of complex functions, analytic function, Cauchy Riemann equations. Cauchy's theorem, Cauchy's integral formulae, Power series, Laurent's Series, Singularities.

7. Differential equations:-

- (i) Linear and Non-linear Differential equation of first order. Linear differential equations with constant coefficients, homogeneous differential equations, Linear differential equation of second order with variable coefficient.
- (ii) Partial differential equation of first and second order.

8. Geometry:-

- (i) **Two dimensional** - circle, parabola, ellipse and hyperbola and their standard properties (rectangular co-ordinate system only).
- (ii) **Three dimensional**- Direction cosines and ratios, straight line, plane, sphere, cone and cylinder with their standard properties.

9. Special functions and integral transforms:-

- (i) Hyper-geometric functions, Legendre's polynomials, Bessel's function. Recurrence relations, orthogonal properties and generating functions.
- (ii) Laplace transform, inverse Laplace transform. Fourier transforms. Convolution theorem.

10. Statics and Dynamics:-

- (i) Equilibrium of co-planner forces, moments, friction, virtual work and catenaries.
- (ii) Velocity and acceleration along radial and transverse directions and along tangential and normal direction, Simple Harmonic motion, Rectilinear motion under various laws, Projectiles.

11. Numerical Analysis and Optimization Techniques:-

- (i) Basic operators and their inter-relations, forward and backward interpolation for equal intervals. Numerical differentiation and integrations.
- (ii) Convex sets and its properties, solution of a Linear Programming Problems by simplex method, duality, Assignment and Transportation problems.

Note: Pattern of the Question Paper :-

- 1. Objective Type Paper
- 2. Maximum Marks-100
- 3. Number of question- 100
- 4. Duration of paper- 2 Hours
- 5. All question carry equal marks
- 6. There will be negative marking.