RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF ASSISTANT PROFESSOR IN MATHEMATICS FOR COLLEGE EDUCATION DEPARTMENT

PAPER – II

1- **Special Functions**: Hypergeometric, Confluent Hypergeometric Functions and their properties. Bessel, Legendre Function/Polynomial of first kind and their properties. Hermite, Laguerre Polynomials and their properties.

2- **Integral Transforms**: Laplace, Inverse Laplace transform and their properties. Fourier transform, Inverse Fourier transform and their properties, Hankel, Mellin transform and their properties.

3- **Differential and Integral Equations**: Classification of Second Order Partial Differential Equations, Green's Functions, Sturm-Liouville Boundary Value Problems, Cauchy's Problems and Characteristics.
Calculus of variation- Variation of a functional, Euler-Lagrange's equation, Necessary and sufficient condition for extrema, Variational method for Boundary Value Problems in ordinary and partial differential equations.
Integral Equations of first and second kind of Fredholm and Volterra type, solution by successive substitutions and successive approximations.

4- **Metric spaces and Topology:** Metric spaces, compactness, Connectedness, Topological spaces, closed sets, closure, Dense set, Neighbourhood. Interior, exterior and boundary points, 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.

5- **Differential Geometry**: Curves in space (Osculating, Normal and rectifying planes, Serret-Frenet formulae, curvature, torsion, circle of curvature and sphere of curvature), Envelopes, curves on sufaces.

6- **Tensors:** Covariant, Contravariant and Mixed tensors, Invariants and algebraic properties of tensors. Contraction of tensors, Quotient Law of tensors. Fundamental and Associated tensors, Christoffel symbols, Covariant differentiation of tensors.

7- **Mechanics**: D'Alembert's Principle, Moment and Product of inertia, Motion in two-dimensions. Lagrange's equations of Motion, Euler's Equations of Motion, Motion of a top.

8- **Numerical Analysis**: Interpolation, Difference schemes, Lagrange's interpolation, Numerical differentiation and integration. Numerical solution by Bisection, Secant, Regula-Falsi and Newton's Methods, Roots of polynominal. Linear Equation – Direct Methods (Jacobi, Gauss and Siedal Method).

9- **Operations Research**: Simplex methods, Duality, Degeneracy, Revised Simplex Method, Integer Programming Problems, Assignment and Transportation Problems, Game Theory– Two person zero sum game, Inventories- Single item deterministic inventory models with finite replacement, simple probabilistic models.

10- **Mathematical Statistics**: Probability, Conditional Probability, Addition and Multiplication theorems of probability, Baye's Theorem, Expectations, Moment Generating Function, Probability Distributions: Binomial, Poisson, Uniform and Normal, Correlation and Regression, Line of Regressions.

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Note :- **Pattern of Question Paper**

1. **Objective type paper**
2. **Maximum Marks : 75**
3. **Number of Questions : 150**
4. **Duration of Paper : Three Hours**
5. **All questions carry equal marks.**
6. **Medium of Competitive Exam: Bilingual in English & Hindi**
7. **There will be Negative Marking.**