RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR EXAMINATION FOR THE POST OF
SR.TEACHER (GRADE-II),
SECONDARY EDUCATION DEPARTMENT

PAPER - II

MATHEMATICS

Part - (i)   180 marks

(Secondary and Senior Secondary standard)

Number system : Irrational numbers, real numbers and their decimal expansions, operation on real numbers, Laws of exponents for real number, Fundamental theorem of Arithmetic.

Plane Geometry : Angles and lines at a point, Angles made by a transversal with two lines, classification of triangles on the basis of sides and angles, Rectilinear figures, congruence of triangles, inequalities of triangles, similar triangles, Area of plane figures, Circles, Arcs and Angles subtended by them, Tangents to a circle.

Algebra : Linear Equations (in two variables), Polynomials in one variable, zeroes of a polynomial, Remainder theorem, Factorization of polynomials, algebraic identifies, Mathematical induction, Binomial theorem, Quadratic equations, nature of roots, linear inequalities, finite and infinite sequences, Arithmetic progression, Geometric Progression, Harmonic Progression, Permutations, Combinations, Matrix, Determinants of order two and three, Inverse matrix, solution of simultaneous linear equations of two and three unknowns, Sets, Relations and Functions, Complex numbers, its elementary properties, Argand plane and polar representation of complex numbers, square root of a complex number.

Surface Area and Volume : Cube, Cuboids, Cone, Cylinder and Sphere, Conversion of solid from one shape to another, frustum of a Cone.

Trigonometry : Angles and their measurements, Trigonometric ratios of acute angles, Angles and lengths of arc, trigonometric functions, compound multiple angles, solutions of trigonometric equations, inverse trigonometric functions, properties of triangles.

Calculus :

1   Differential Calculus - Limits, differentiability, continuity, derivative of Sum and Difference, derivative of product of functions, Composite functions, implicit functions, trigonometric functions, parametric functions, Second order derivative, Rolle's and Lagrange's mean value theorem, applications of derivatives, Increasing/decreasing function, tangents and normals, maxima and minima of one variable.

2   Integral Calculus - Indefinite integrals, definite integrals, definite integral as a limit of sum, Applications of definite integral in finding the area under simple curves, arc of circles, lines/parabola/ellipse, area between the two above said curves.

Co-ordinate Geometry :

1   **Two Dimensional Geometry -** Distance between two points, Sections formula, area of triangle, locus, equations of straight line, pair of straight lines, circles, parabola, ellipse, hyperbola, their equations, general properties, tangent, normal, chord of contact, pair of tangents.

2   **Co-ordinate Geometry in 3 - dimensions –** Co-ordinate axes and co-ordinate planes in three dimensions, co-ordinates of a point, distance between two points and section formula, direction cosines/ratios of a line joining two points, Cartesian and vector equation of a line, coplaner and skew lines, shortest distance between two lines, cartesian and vector equation of a plane, Angle between (i) two lines, (ii) two planes (iii) a line and a plane, distance of a point from a plane.

Statistics : Mean, Mode, Median, Quartiles, Deciles, Percentiles, Measure of dispersion, Probability - Laws of probability, addition and multiplications law, conditional probability, Random variable and probability distributions, repeated independent (Bernoulli) trials and Bionomial distribution.

Vector - Dot product, Cross product, their properties, Scalar triple product, Vector triple product and related problems.

Part - (ii)   80 marks

(Graduation Standard)

1   **Abstract Algebra -** Group, Normal subgroup, permutation group, Quotient group, Homomorphism & groups, Isomorphism theorems, Calay and Lagrange's theorems, Automorphism.

2   **Calculus -** Partial derivatives, Maxima and Minima of functions of two variables, Asymptotes, double and triple integrals, Beta and Gamma functions. Mean Value Theorems.

3   **Real Analysis -** Real numbers as a complete ordered field, linear sets, lower and upper bounds, limit points, closed and open sets, Real sequence, limit and convergence of a sequence, Riemann integration, convergence of series, absolute convergence, uniform convergence of sequence and series of functions.

4   **Vector Analysis -** Differentiation of a vector functions of scalar variable, Gradient,   divergence   and curl (rectangular co-ordinates), vector identities, Gauss's Stoke's and Green's theorems.

5   **Differential Equations -** Ordinary differential equations of first order and first degree, differential equations of first order but not of first degree, Clairaut's equations, general and singular solutions, linear differential equations with constant coefficients, homogeneous differential equation, second order linear differential equations, simultaneous linear differential equations of first order.

6   **Statics and Dynamics :** Composition and resolution of co-planer forces, component of a force in two given directions, equilibrium of concurrent forces, parallel forces and moment, velocity and acceleration, simple linear motion under constant acceleration, Laws of motion, projectile.

7   **Linear Programming -** Graphical method of solution of linear programming in two variables, convex sets and their properties, simplex method, Assignment problems, Transportation problems.

8   **Numerical Analysis and Difference Equation -** Polynomial interpolation with equal or unequal stepsize, Lagrange's interpolation formula, Truncation error, Numerical differentiation, Numerical integration, Newton-Cotes quadrature formula, Gauss's quadrature formulae, convergence, Estimation of errors, Transcendental and polynomical equations, bisection method, Regula-falsi method, method of interation, Newton - Raphson method, Convergence, First and higher order homogeneous linear difference equations, non homogenous linear difference equations, Complementary functions, Particular integral.

Part - (iii)   40 marks

(Teaching Methods)

-     Meaning and Nature of Mathematics.
-     Aims & Objectives of Mathematics Teaching.
-     Methods of Mathematics Teaching (analytic, synthetic, inductive, deductive, heuristic, Project & Laboratory).
-     Using various techniques of teaching mathematics viz - Oral, written, drill, assignment, supervised - study & programmed Learning.
-     Arousing and maintaining interest in learning of Mathematics.
-     Importance & meaning of planning, Preparing Lesson Plan, Unit Plan, Yearly Plan, Short Lesson Plan.
-     Preparing low cost improvised teaching aids, Audio-Visual aids in Mathematics.
-     Transfer of mathematics learning to various subjects and actual life situation.
-     Planning & equipments of Mathematics laboratory.
-     The mathematics teacher academic & professional - preparation.
-     Principle of curriculum & qualities of a good text book.
-     Process of obtaining feed-back and evaluation in Mathematics in terms of Cognitive, Affective and Psycho-motor Development.
-     Preparation and use of tests for evaluation such as achievement test & diagnostic test.
-     Diagnostic, Remedial and enrichment programmes with respect to syllabus at Secondary and Senior Secondary stages.
-     Mathematics for gifted and retarded children.

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For the competitive examination for the post of senior teacher :-

1   The question paper will carry maximum 300 marks.
2   Duration of question paper will be **Two Hours Thirty Minutes**.
3   The question paper will carry 150 questions of multiple choices.
4   Paper shall include following subjects carrying the number of marks as shown against them :-
      (i)   Knowledge of Secondary and Sr. Secondary Standard
              about relevant subject matter.   180 Marks
      (ii)   Knowledge of Graduation Standard about
              relevant subject matter.   80 Marks
      (iii)   Teaching Methods of relevant subject.   40 Marks
                                                   Total   300 Marks
5   All questions carry equal marks.
6   There will be **<u>Negative Marking.</u>**

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