SCHOOL ASSISTANT - MATHEMATICS
SYLLABUS

Part – I
GENERAL KNOWLEDGE AND CURRENT AFFAIRS (Marks: 10)

Part - II
PERSPECTIVES IN EDUCATION (Marks: 10)

1. History of Education : Pre-Vedic and Post-Vedic period, Medieval Education, Recommendations of various committees during British period with special reference to Woods Despatch (1854), Hunter Commission (1882), Hartog Committee (1929), Sargent Committee (1944), Recommendations of various committees during post independent period with special reference to Mudaliar Commission (1952-53), Kothari Commission(1964-66), Ishwarbhai Patel committee (1977), NPE-1986, POA-1992

2. Teacher Empowerment: Meaning, interventions for empowerment, Professional code of conduct for teachers, Teacher motivation, Professional development of Teachers and Teacher organizations, National / State Level Organizations for Teacher Education, Maintenance of Records and Registers in Schools.

3. Educational Concerns in Contemporary India: Environmental Education, Meaning and scope of Environmental Education, Concept of sustainable development, Role of Teacher, School and NGOs in development and protection of environment, Democracy and Education, Equality, Equity, Quality in Education, Equality of Educational opportunities, Economics of Education, Meaning and scope, Education as Human Capital, Education and Human Resource Development, Literacy – Saakshar Bharat Mission, Population Education, Significance of Population Education, Population situation, policies and programmes in India, Approaches to Population Education and role of school and teacher, Themes of population Education, Family life Education, Sustainable development, Adolescence Education, Health Education, Gender – Equality, Equity and Empowerment of Women, Urbanization and migration, Life skills, Inclusive Education, Conceptual Clarification and Definition, Prevalence, Myths & Facts, Characteristics, Classification & Types, Importance of Early Identification and assessment, Planning Inclusive Education, Classroom Management in Inclusive Education, Evaluation, Documentation and Record Maintenance, Psycho-Social management, Awareness & Sensitization Strategies, Liberalization, Privatization and Globalization, Value Education, Sarva Siksha Abhiyan, National Programme for Education of Girls at Elementary Level (NPEGEL), Mid-day-meals, Rashtriya Madhyamika Siksha Abhiyan(RMSA), KGBVs and SUCCESS Schools.

4. Acts / Rights: Right of Children to Free and Compulsory Education Act, 2009, Right to Information Act, 2005, Child Rights, Human Rights

5. National Curriculum Framework, 2005: Perspective, Learning and Knowledge, Curricular Areas, School Stages and Assessment, School and Classroom Environment, Systemic Reforms

Part - III
CONTENT (Marks: 44)

1. NUMBER OF SYSTEM: Number system (N,W,Z,Q,R,)and their properties, diff. types of surds, Rationalization of mono, Binomial surds, extraction of square roots of real numbers. Complex number as an order pair of real numbers and their fundamental operations, representation in the form of a+ib –conjugate complex numbers, Modules and amplitude of complex numbers-illustrations, geometrical representations of complex numbers in Argand plane- Argand diagram. Prime and composite numbers, types of primes (co, twin, relative etc.) prime factors, multiple factors, GCF, LCM, relation bet. GCD & LCM. Modulus of a real number, Absolute value

2. SETS AND RELATIONS: Statements: Consecutiveness, Negation, Disjunction, Conjunction, Conditional, Bi-conditions (Bi-Implications), algebra of statements, Quantifies ,Converse, Inverse and contra positive of a conditional, proofs Direct and indirect proofs – methods of disproof, an application of truths tables to switching networks, sets – proofs of some laws of set operations, principle of duality, a comparison between the algebra of sets and statements, Tautologies and contradictions, Concept of a set: Definition ,Null set, equality of set, cardinal number, subset, super set, Universal set, union, intersection, venn diagrams, compliment,
Relations: Ordered pairs, image, pre-image, range, injection, surjection, Bijection, finite set Cartesian products, Domain and range of a relations, Inverse relation, Types of relations, Relations and functions. Functions: Types of functions-definitions, Theorems on function, Domain, Range, inverse and real valued functions. Identity function, Constant function, Equal function, even and odd function, polynomial functions, Rational functions, Algebraic functions, Exponential functions, Logarithmic functions, Exponential and Logarithmic Series, Greatest Integer functions. Composite function, and its property, graphs of functions, Compound functions. Equations of functions
Limits: Concept, and limits of a function. Continuity, Neighbourhoods.

3. COMMERCIAL MATHEMATICS: Ratio and proportion, Rate, Unitary method, Percentages, Trade Discount, Average, Simple interest, Compound interest, Partnership, Time and distance, Time and work, clocks and calendar problems.
ALGEBRA: Laws of exponents: Laws of rational indices, Multiplication and division of polynomials, some special products, Factorization of Quadratic Expressions.
Logarithms: Definition, simple laws of logarithms, some additional laws, characteristic, Mantissa Exponents.

Algebra of expressions: Square roots, Homogeneous, Symmetric cyclic expression and Factorization, symmetric expressions, cyclic expressions, quadratic equations, reciprocal equation, relation between roots and coefficients, nature of roots, to find the quadratic equation whose roots are given. Remainder theorem, Horner's method, trial and error method, finding multiple roots, graphical solutions.

Binomial Theorem: Standard binomial expansion, theorem, integral part, fractional part, numerically greater terms, largest   problems, approximation using Binomial theorem.

Mathematical induction: principles of mathematical induction and theorems and its applications, problems on divisibility.

4. LINEAR EQUATIONS: Linear equations in two variables: System of linear equations, Simultaneous equation in two variables, Dependant equations, Linear equations and their graphs, Linear functions , System of equations, linear programming-problems (LPP). The fundamental theorem, graphical method of solving an LPP, a closed converse polygon, general graphical methods – application of LPP.

In-equations: Linear in-equations and their graphs, System of in-equations. Linear equations in two variables, System of linear equations, simultaneous equation in two variables Dependant equations, linear equations and their graphs, linear functions, system of equations, System of two points, which is not parallel to X-axis, Midpoint of the segment following $A(x1,y1)$, $B(x2,y2)$ equation of a line passing through the origin having slope m, The slope intercept form of a line, the point slope form of a line, the intercept form of a line, the two point form of a line, linear in-equations, their graphs,   system of linear in-equations.

Rational integral of x, remainder theorem, Horner's method of synthetic division, problems leading to quadratic equations, graphical solutions of quadratic, Quadratic inequalities in one variable, solution of quadratic in-equations the principle of mathematical induction , The binomial theorem, Pascal triangle.

Quadratic expressions, equations in one variable, sign of quadratic expressions, changes in signs and maximum and minimum values, quadratic in-equations, relation between the roots and the coefficient in an equation, remainder theorem, connecting problems, solving an equation when two or more of its roots are connected by Cartesian relations, Horner's method of synthetic division, trial and error method, Procedure to find multiple roots.

5. GEOMETRY

Structure of geometry, axioms, Historical background, Basic axioms, Parallel line, theorems, triangles and polygons, angles of a polygons, theorems based on, Polygon congruence of triangle SAS, ASA, SSA, axioms, Parallelogram and its properties, Triangles, Particular types, geometric inequalities in a triangles some theorem, circles and concurrent lines in triangles, Theorems based on circles,

Concurrent lines in a triangle, Median, Altitudes of a triangle, line of symmetry, axis of symmetry, point symmetry, image of an angle.

Quadrilaterals, example of different Quadrilaterals, Parallel lines and triangles, theorems, intercept, Theorems, locus, points equidistant from two given points. Theorems, an concurrency, attitude, circum centre, ortho centre, centroid, Areas, polygonal region, Area axiom, congruent axiom, area monotonic axiom, area of parallelogram theorem, Area of Triangle, Theorem based quit, circles are of a circle, semi circle, segment of a circle, Congruence of a circle, Theorems based on circle.

Similar polygons, similar triangle and their properties, Basic proportionality theorem, vertical angle bisection theorem, Similar Triangle, AAA similarity, SSA, SAS similarities Pythagoras theorem, Tangents to a circle, different properties of a tangent to a circle, segments of a chord, Common tangents to two circles.

GEOMETRICAL CONSTRUCTIONS

Construction of triangles, constructions involving concurrence lines, triangles and circles, harder cases, Geometrical constructions involving circles and tangents and triangles and quadrilaterals.

6. MENSURATION

Square, rectangle, triangle, Quadrilateral, Circle, Ring (Annulus), Sector.

Prism, total surface area of right prism, volume of a prism, Volume of a cube, Cuboids, The right pyramid, Cylinder, Hollow cylinder, Cylindrical shell, ratio's of cylinders, cone, Hollow cone, solid cone, Curved surface area, total surface area, volume of a right circular cone, Sphere: Surface area of a sphere, total surface area of a hemisphere, Volume of a sphere, Hollow hemisphere.

7. MATRICES

Matrix Definition, Order of a matrix, Types of matrices, Equality of two matrices, Addition, Subtraction, multiplication of matrix, Product of two matrices, properties of products of matrices, transpose of matrix, properties, skew symmetric matrix, Adjoint and inverse of a matrix, simultaneous linear equations, types of system of simultaneous linear equations, consistency and inconsistency of Simultaneous equation. .

Multiplicative inverse of a square matrix, singular and non singular matrix, solution of a system of linear equations in two variable using matrices determinants, properties of determinants, Matrix inverse method and Cramer's , Inversion and Gauss Jordan method and Solving Equations

Triangle matrices, properties of addition of matrices, sector multiple of a matrix

8. STATISTICS

Cumulative frequency distribution, LCFD, GCFD, Frequency graphs, lesser then frequency distribution, Greater than frequency distribution.

Central Tendency: means of the ungrouped data, Weighted AM, means grouped data, Merit and demerits of AM, Medians from ungrouped and grouped data, mode of ungrouped and grouped data, Empirical relation among mean, Median and mode. Probability: Random Experiments and Events, Definition, Axiomatic Approach, Independent and Dependent Events, Conditional Probability, Bayes Theorem, random variables , theoretical distributions.

9. COMPUTING

Introduction to computers, Historic development of computers, Structure of a computer, working characteristics of Computers, Problem solving, flow charts and their representation, Operations box, Data box, Decision box, loops, Algorithm, Flow diagram using boxes for mechanics.

10. PROGRESSIONS

Progressions: Common difference, nth term, sum of the first nth terms Arithmetic, Geometric and Harmonic Progressions and problems. AM, GM, HM and its Problems.

11. TRIGONOMETRY

Unit of measurement of angles: Radian measure, relation between radian and degrees, 6 Trigonometric ratios and transformations, behavior of trigonometric functions, Trigonometric functions of complementary angles, trigonometrically tables. Inverse trigonometric functions, Hyperbolic Functions, Properties of Triangles, graphs and periodicity, Trigonometric ratios of compound angles, Trigonometric ratios of multiple and sub multiple angles, Angle of elevation and angle of depression, heights and distance. Trigonometric Expansions.

12. ANALYTICAL GEOMETRY

Distance between two points, Division of a segment internally and externally in a given ratio, slope, Area of triangle, The Straight Line; Pairs of St Lines.

LOCUS, Transformation of Axes.

Three Dimensional Geometry: Co-ordinates; Direction Cosines and Ratios; Cartesian equation of a plane. Circles and System of Circles, Parabola, Ellipse, Hyperbola and polar coordinates.

Part – IV
Teaching Methodology (Marks: 16)
1. Meaning and Nature of Mathematics, History of Mathematics.
2. Contributions of Great Mathematicians – Aryabhatta, Bhaskaracharya, Srinivasa Ramanujan, Euclid, Pythagoras, George cantor.
3. Aims and Values of teaching Mathematics, Instructional objectives (Blooms taxonomy)
4. Mathematics curriculum: Principles, approaches of curriculum construction, -Logical and Psychological, Topical and Concentric, Spiral approaches. Qualities of a good Mathematics text book.

5. Methods of teaching mathematics- Heuristic method, Laboratory method, Inductive and Deductive methods, Analytic and Synthetic methods, Project method and Problem Solving method.
6. Unit Plan, Year Plan, Lesson Planning in Mathematics.
7. Instructional materials, Edgar Dale's Cone of Experience.
8. Evolving strategies for the gifted students and slow learners,
9. Techniques of teaching mathematics like Oral work, Written work, Drilling, Assignment, Project, Speed and Accuracy.
10. Mathematics club, Mathematics structure, Mathematics order and pattern sequence.
11. Evaluation – Types, Tools and Techniques of Evaluation, Preparation of SAT Analysis, Characteristics of a good test.