MATHEMATICS AND STATISTICS
(ARTS AND SCIENCE)
STD. XI - PART – I

1. **Measurement of Angles** : Need & concept, Revision of directed angle (+ve and –ve angles), zero angle, straight angle, angles in standard position, coterminal angles, angles in quadrant & quadrantal angles. Sexagesimal system, circular system, relation between degree measure and radian measure. **Theorem:** Radian is a constant angle. Length of an arc of a circle ($s = r. \theta$, θ is in radians) (without proof). Area of the sector of a circle $A = \frac{1}{2} r^2. \theta$, θ is in radians (without proof).

2. Trigonometric functions: Need & concept, Trigonometric functions with the help of standard unit circle, signs of trigonometric functions in different quadrants, trigonometric functions of particular angles (0^0, 30^0, 45^0, 60^0, 90^0, 180^0, 270^0, 360^0), domain and range of trigonometric functions, periodicity of functions, fundamental identities, graphs of trigonometric functions, Graph of $Y = a \sin bx$, $y = a \cos bx$, trigonometric functions of negative angles.

3. Trigonometric functions of compound angles : Introduction, trigonometricfunctions of sum and difference, trigonometric functions of multiple angles (upto double and triple angles only), trigonometric functions of half angles.

4. Factorization Formulae: Introduction, Formulae for conversion of sum or difference into products, formulae for conversion of product into sum or difference, trigonometric functions of angles of a triangle.

5. Locus : Introduction, Definition and equation of locus, points of locus, shift of the origin.

6. Straight Line : Revision. Inclination of a line, slope of a line, equation of lines, parallel to co-ordinate axes, intercepts of a line, revision of different forms of equations of a line, slope point form, slope intercept form, two point form, double intercept form other forms of equations of a line, parametric form, normal form, general form, Theorem : A general linear equation $Ax + By+ C =0$, provided A and B are not both zero, simultaneously, always represents,straight line. Theorem 2 : Every straight line has an equation of the form $Ax +By + C = 0$, where A, B and C are constants (without proof), Reduction of general equation of a line into normal form,

intersection of two lines, parallel lines, perpendicular lines, identical lines, condition for concurrency of three lines, angle between lines, distance of a point from a line, distance between two parallel lines, equations of bisectors of angle between two lines, family of lines, equation of a straight line parallel to a given line, equation of a straight line perpendicular to a given line, equation of family of lines through the intersection of two lines.

7. Circle and Conics : Revision, standard equation, centre-radius form, diameter form, general equation, parameter equations of standard equation, Conics Napees – Intersection of Napees of a cone and Plane, introduction, focus-directrix property of parabola, ellipse, hyperbola, parabola, standard equation (different forms of parabola), parametric equations, ellipse, standard equation, hyperbola, standard equation, parametric equations. Application of conic section.

8. Vectors : Definition, magnitude of a vector, free and localized vectors, types of vectors, zero vector, unit vector, equal vector, negative of a vector, collinear vectors, coplanar vectors, coinitial vector, like and unlike vector, scalar multiple of a vector, triangle law, parallelogram law, polygon law, properties of addition of vectors, three dimensional co-ordinate geometry, co-ordinate axes & coordinate planes in space, co-ordinates of a point in space, distance between two points in a space, unit vectors along axes, position vector of a point in space, product of vectors, scalar product, definition, properties, vector product, definition, properties, simple application, workdone by force, resolved part of a force, moment of a force.

9. Linear Inequations : Linear in equations in one variable – solution of linear inequation in one variable & graphical solution, solutions of system of linear in equations in one variable, Linear in equations in two variable – solution of linear inequation in one variable & graphical solution, solution of linear in equations in two variable & graphical solution, solutions of system of linear inequations in two variables, Replacement of a set or domain of a set, Transposition.

10. Determinants : Revision, determinant of order three–definition, expansion, properties of determinants, minors & co-factors, applications of determinants condition of consistency, area of a triangle, Cramer's rule for system of equations in three variables.

11. Matrices : Introduction, concepts, notations, order, types of matrices – zero matrix, row matrix, column matrix, square matrix, determinant of a square matrix, diagonal matrix, scalar matrix, identity matrix, triangular matrices, singular & non-singular matrices, transpose of a matrix, symmetric & skew symmetric matrices, operations on matrices – equality, addition, subtraction, multiplication of a matrix by a scalar, simple properties, multiplication of matrices – definition, properties of matrix multiplication, properties of transpose of a matrix -
$(A')' = A$, $(KA)' = KA'$, $(AB)' = B'A'$.

PART – II

1. Sets, Relations and Functions : Set – Revision, subset, proper, improper, subset and their properties, union, intersection, disjoint sets, empty set, finite & infinite sets, equal sets, equivalent sets, universal set, Venn diagrams, complement of a set, difference of two sets, power set, Relations – ordered pairs, equality of ordered pairs, Cartesian product of two sets, No. of elements in the Cartesian product of two finite sets, Cartesian product of the reals with itself, definition of relation, pictorial diagrams, domain, codomain and range of a relation, types of relations, one-one, many-one, binary equivalence relation, functions – function as a special kind of relation, pictorial representation of a function, domain, codomain and range of a function, equal functions, types of functions, constant function, identity function, one-one function, onto function, into function, even & odd functions, polynomial function, rational function, modulus function, signum & greatest integer, exponential function, logarithmic function, functions with their graphs, sum, difference, product quotient of functions, scalar multiplication, composite function, inverse function, binary operations, real valued function of the real variable, domain and range of these functions.

2. Logarithms : Introduction, definition, properties, laws of logarithms, change of base, characteristics & mantissa – method of finding characteristics, method of finding mantissa, method of finding antilogarithm.

3. Complex Numbers : Introduction, need for complex numbers, definitions –(real parts, imaginary parts, complex conjugates, modulus, argument), algebra of complex numbers – equality, addition, subtraction, multiplication, division, powers and square root of a complex number – higher powers of i, Demoivre's formula – (without proof), square root of a complex number, properties of complex numbers – properties of addition of complex numbers, 1) Closure Property,2) Commulative Law, 3) Associative law, 4) Existence of additive identity,5) Existence of additive inverse. Properties of product of complex numbers –Existance of multiplicative identity – Existence of multiplicative inverse properties of conjugate & modulus of complex numbers, Argand Diagram – representation of a complex number as a pt. in plane, geometrical meaning of modulus and argument, polar representation of complex numbers, fundamental theorem of algebra, cube roots of unity – solution of quadratic equations in the complex number system, cube roots of unity.

4. Sequences & Series : Revision sequence, A.P., Sum of first n terms of A.P. properties of A. P. geometric progression – introduction, general term, sum of the first 'n' terms, n terms from the end of G.P. containing finitely many terms & sum to infinite terms properties of G.P., H.P. as a special type of A.P, Means – arithmetic mean, geometric means, harmonic mean, relation between A.M., G.M., H.M., Arithmetic-Geometric sequence, special series, sum of cube of first n natural, sum of cube of first n odd natural nos., exponential & logarithmic series.

5. Permutations & combinations : Introduction, fundamental principle of counting, factorial notation, permutations, when all r objects are distinct, when all r objects are not distinct, circular permutations, simple applications, combinations – definition, properties, relations between permutations and combinations, simple applications.

6. Mathematical Induction and Binomial Theorem : Principle of mathematical induction, simple applications, binomial theorem – binomial theorem for positive integers, general term, particular term, properties of binomial co-efficient with simple application, binomial theorem for any index (without proof), particular cases of binomial theorem, simple applications.

7. Limits : Introduction of concept, meaning of $x \to a$, the limit of a function, fundamental theorem on limits, algebra of limits – standard limits, with proof, limits at infinity – concepts, simple problems.

8. Differentiation : Definition of a derivative, derivative at a point, geometrical significance of derivative, physical significance (velocity as a rate of change of displacement), derivatives from first principle of trigonometric functions, logarithmic functions, algebraic functions, exponential functions, rules of differentiation – derivative of sum, difference, product and quotient.

9. Integration: Definition (of integration) as antiderivative, geometrical interpretation of indefinite integrals, algebra of integrals – integrals of some standard functions, rules of integration.

10. Statistics : Measures of dispersion – range, quartile & quartile deviation (for grouped and ungrouped data), comparison of two frequency distributions with same mean, mean deviation about mean, mean deviation about median (for grouped & ungrouped data), variance, standard deviation, effect of change of origin and scale on variance and standard deviation, combined variance and standard deviation, co-efficient of variation.

11. Probability: Revision, types of events – events and algebra of events, axiomatic definition of probability, mutually exclusive and exhaustive events, mutually exlusive events, addition theorem – for any two events A and B, Result on compatible events. Conditional probability – definition, multiplication theorem, independent events, Baye's theorem, odds in favour and against.