

**TRAINED GRADUATE TEACHER  
SUBJECT: MATHEMATICS**

**PAPER-I**

**Unit I:-**

1. **Linear equation in two variable :** Pairs of linear equation in two variables, condition for consistency and inconsistency, solution of pair of linear equations in two variables, algebraic method of solving a pair of linear equation, substitution method, elimination method , cross multiplication method.
2. **Principle of Mathematical Induction. :-** Process of proof by induction, the principle of mathematical induction and its simple application.
3. **Complex number and quadratic equation:-** Need for complex number especially  $\sqrt{-1}$  to motivate by inability to solve quadratic equation  $x^2 + 1 = 0$ , Brief description of Properties of complex numbers. Argand plane and polar representation of a complex number, solution of quadratic equation in the complex number system.
4. **Linear In equation:** - Linear inequation, solution of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of a system of linear inequalities in two variables. Solution of system of linear inequalities in two variables graphical.
5. **Permutations and Combinations:** - Fundamental Principle of counting, factorial  $n$  ( $n!$ ). Permutations and combinations and their simple applications.
6. **Binomial Theorem:** - Statements and proof of the binomial theorem for positive integral indices. General and Middle terms in binomial expansion, simple application.
7. **Sequence and Series:-** Sequence and series , Arithmetic progression (A.P), Arithmetic Mean (A.M). Geometric Progression (G.P), Geometric Mean (G.M), sum of  $n$  terms of A.P and G.P, General terms of A.P & G.P, relation between A.M to G.M, sum of  $n$  terms of the special series  $\Sigma n$  (sum of first  $n$  natural numbers),  $\Sigma n^2$  (sum of square of first  $n$  natural numbers) and  $\Sigma n^3$  (sum of cubes of first  $n$  natural numbers)

**UNIT –II: AREAS AND VOLUME**

Area of a triangle using Heron's formula and its application in finding the area of a quadrilateral, surface area and volume of cubes, cuboids, cone, cylinder, spheres and hemisphere.

**UNIT –III: STATISTICS**

Introduction of statistics, collection of data, presentation of data in tabular form, Mean, median, mode of ungrouped and grouped data, mean deviation and standard deviation of ungrouped and grouped data, variance.



## PAPER-II

### Unit I:-

**Matrices and Determinants:-** Concept , notion order , equality, types of matrices, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication, Concept of elementary row and column transformation, Invertible matrices. Determinant of a square matrix (up to  $3 \times 3$  order), properties of determinant, Minors and co-factors and application of determinants in finding the area of a triangle, Adjoint and inverse of a matrix, solving a system of linear equations in two or three variable ( having unique solution ) using inverse of a matrix.

### UNIT-II: PROBABILITY

Multiplication theorem on probability, conditional probability independent events, total probability, Baye's theorem , Random variables and probability distribution, mean and variance of random variable, Bernoulli's trials and Binomial distribution.

### UNIT-III: VECTOR

Vector and scalars, Direction cosines and direction ratios of a vector, types of vector, addition of vectors, multiplication of a vector by a scalar, section formula, scalar(dot) product and vector (cross) Product of two vectors, projection of a vector on another vector, scalar and vector product of three vectors .

### UNIT – VI: CALCULUS

#### 1. DIFFERENTIAL CALCULUS

Continuity and differentiability, derivative of composite function, chain rule, derivative of inverse trigonometric function, derivative of implicit function, Concept of exponential and logarithmic function and their derivatives. Logarithmic differentiation, derivative of function expressed in parametric forms. Second order derivative. Application of derivatives rate of change of quantities, increasing and decreasing functions, tangents and normals, maxima and minima, approximation.

#### 2. INTEGRAL CALCULUS :-

Integration as inverse process of differentiation, integration of a variety of functions by substitution, by partial fraction and by parts, Definite integrals, Some Properties of definite integrals, Application of integrals in finding the area under simple curves, especially lines / circles / parabolas / ellipses (in standard form only ) and area between the two above said curves.

#### 3. DIFFERENTIAL EQUATION:-

Definition, order and degree, general and particular solution of a differential equation, Formation of differential equation whose general solution is given, Solution of differential equation by method of separation of variables, homogenous differential equation of first order and first degree, Solution of linear differential equations of the form  $dy/dx + py = q$  where p and q are functions of x or constants ( or  $dx/dy + Py = Q$  where P, Q are functions of y or constants)



### UNIT -V: ANALYTICAL GEOMETRY

Co- ordinate Geometry, the Cartesian plane, co-ordinates of a point in Cartesian plane, distance between two points, sections formula, area of a triangle, straight line, slope of a line, various forms of equation of a line, general equation of a line distance of a point from a line, Conic section, ellipse, parabola, hyperbola, circle, pair of straight lines. Homogenous equation of 2<sup>nd</sup> degree, angle between a pair of straight lines, Condition for general equation of 2<sup>nd</sup> degree to represent a pair of straight lines, vector and Cartesian form of equation of straight lines in space. Shortest distance between two lines in space and equation of shortest distance, Vector and Cartesian equation of a plane, General equation of a sphere, intersection of plane and sphere, equation of a tangent plane.

### UNIT -VI: TRIGONOMETRY

Trigonometric ratios of an acute angle of a right angled triangle, relationship between the trigonometric ratios, trigonometric identities, trigonometric ratios of complementary angles, height and distances.

Positive and negative angles, measuring angles in radian and degree and their conversion from one measure to another measure. Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ . General solution of trigonometric equation of the type  $\sin x = \sin \alpha$ ,  $\cos x = \cos \alpha$  and  $\tan x = \tan \alpha$ . Simple application of sine and cosine formula, Inverse trigonometric function: definition, domain, range and principle value branch. Elementary properties of inverse trigonometric function, De-moivre's theorem for rational indices, expansion of  $\sin nx$  and  $\cos nx$  in power of  $x$ , exponential expression for circular function and its arguments, Gregory's Series, hyperbolic function.