MATHEMATICS (MATH)

Class - Xl

Full Marks: 100

Units	Title	Marks
I.	SETS AND FUNCTIONS	18
II.	ALGEBRA	25
III.	COORDINATE GEOMETRY	l7
IV.	CALCULUS	08
V.	MATHEMATICAL REASONING	04
VI.	STATISTICS AND PROBABILITY	08
	TOTAL	**80**

UNIT-I : SETS AND FUNCTIONS

1. Sets :

Sets and their representations. Empty set. Finite & Infinite sets. Equal sets. Subsets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal Set.

Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement sets.

2. Relations & Functions

Ordered pairs, Cartesian product of sets. Number of elements in the cartesian product of two finite sets. Cartesian product of the reals with itself (upto Rx Rx R). Definition of relation, pictorial diagrams, domain codomain and range of a relation. Function as a special kind of relation from

one set to another. Pictorial representation of a function, domain, co-domain & range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

3. Trigonometric Functions :

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $Sin^2 X + Cos^2 X = 1$, for all X. Signs of trigonometric functions and sketch of their graphs. Expressing Sin $(X \pm Y)$ in terms of Sin x, Sin y, Cos x & Cos y. Deducing the identities like it following :

$$\tan (x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y} \ , \qquad \text{Cot } (x \pm y) = \frac{\text{Cot x Cot y} \mp 1}{\text{Cot y} \pm \text{Cot x}}$$

$$\text{Sin x + Sin y} = 2 \text{ Six} \frac{x+y}{2} \ \text{Cos} \frac{x-y}{2} \ , \qquad \text{Cos x + Cos y} = 2 \text{ Cos } \frac{x+y}{2} \ \text{Cos} \frac{x-y}{2}$$

$$\text{Sin x - Sin y} = 2 \text{ Cos } \frac{x+y}{2} \ \text{Sin} \frac{x-y}{2} , \qquad \text{Cos x - Cos y} = 2 \text{ Sin } \frac{x+y}{2} \ \text{Sin } \frac{x-y}{2}$$

Identities related to sin2x, cos2x, tan2x, sin3x, cos3x and tan 3x. General solution of trigonometric equations of the type $\sin\theta = \sin\alpha$, $\cos\theta = \cos\alpha$ and $\tan\theta = \tan\alpha$.

Prcof and simple application of sine and cosine rules only.

UNIT-II : ALGEBRA

1. Principle of Mathematical Induction:

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications

2. Complex Numbers and Quadratic Equations:

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers.

Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.

Square-root of a complex number, Cube roots of unity and their properties.

3. Linear Inequalities:

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables.

Solution of system of linear inequalities in two variables - graphically. Inequalities involving modulus function.

4. Permutations & Combinations:

Fundamental Principle of counting. Factorial n. (n!) Permutations and combinations, derivation of formulae and their connections, simple applications.

5. Binomial Theorem:

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, General and middle term in binomial expansion, simple applications.

6. Sequence and Series :

Sequence and Series. Arithmetic progression (A.P.), arithmetic mean (A.M.), Geometric progression (G.P.), general term of G.P., sum of n terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Arithmetic/geometric series, infinite G.P. and its sum, Sum to n terms of the special series Σn, Σn^2 and Σn^3.

UNIT-III : COORDINATE GEOMETRY

1. Straight Lines:

Brief recall of 2D from earlier classes. Shifting of origin. Slope of a line and angle between two lines. Various forms of equations of a line : parallel to axes, point-slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

2. Conic Sections:

Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section.

Standard equation of a circle; General equation of a circle; Standard equations and simple properties of parabola, ellipse and hyperbola. Introduction of directix of an ellipse and hyperbola.

3. Introduction to Three - dimensional Geometry:

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point.

Distance between two points and section formula.

UNIT-IV : CALCULUS

1. Limits and Derivatives:

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

UNIT-V : MATHEMATICAL REASONING

1. Mathematical Reasoning:

Mathematically acceptable statements. Connecting words / phrases consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words difference between contradiction, converse and contrapositive.

UNIT-VI : STATISTICS & PROBABILITY

1. Statistics:

Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability:

Random experiments outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Project : 20 Marks