

Code : 223

MATHEMATICS

Maximum Marks: 100

Time: 3 hrs

Topics	Marks
Unit-I Sets	06
Unit-II Relations and Functions	06
Unit-III Trigonometry	12
Unit-IV Mathematical Induction	04
Unit-V Permutation and Combinations	06
Unit-VI Complex Numbers and Linear In equations	06
Unit-VII Limits and Derivatives	10
Unit-VIII Co-ordinate Geometry (Straight Line)	06
Unit-XI Conic Section (Circles) Parabola, Ellipse, Hyperbola	10
Unit-X Probability	06
Unit-XI Statistics	06
Unit-XII Binomial Theorem	06
Unit-XIII Sequences and Series	08
Unit-XIV Three Dimensional Geometry	04
Unit-XV Mathematical Reasoning	04

Unit-I**Sets**

Sets and their representation. Empty set. Finite and 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. Compliment of a set.

Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the reals with itself (up to $R \times R \times R$).

Unit-II**Relations and Functions**

Definition of relation, pictorial diagrams, domain, co-domain and range of relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain and co-domain and 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 graphics. Sum, difference, product and quotients of functions.

Unit-III**Trigonometry**

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 $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$, $\cos x$ and $\cos y$. Deducing the following identities:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \quad \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \quad \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \quad \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}.$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$. General solution of trigonometric equations of the type $\sin \theta = \sin \alpha$, $\cos \theta = \cos \alpha$ and $\tan \theta = \tan \alpha$. Proofs and simple applications of sine and cosine formulae.

SYLLABUS CLASS XI

Unit-IV Mathematical Induction

The Principal of Mathematical induction and Simple Applications.

Unit-V Permutation and Combinations

Fundamental principle of counting. Factorial n . Permutations and combinations, derivation of formulae and their connections, simple applications.

Unit-VI

Complex Numbers and Linear Inequations

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 equation in the complex number system.

Linear inequalities. Algebraic solution 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.

Unit-VII Limits and Derivates

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-VIII Straight Lines

Brief recall of 2d from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form. General equation of a line. Distance of a point from a line.

Unit-IX Conic Sections (Circles)

Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

SYLLABUS CLASS XI

Unit-X Probability

Random experiments: Outcomes, spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes.

Unit-XI Statistics

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

Unit-XII 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.

Unit-XIII Sequence and Series

Sequence and Series. Arithmetic Progression (A.P.), arithmetic mean (A.M.). Geometric progression (G.P.) general term of a G.P., sum of n terms if a G.P. and A.P. Geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series: $\sum n$, $\sum n^2$ and $\sum n^3$.

Unit-XIV Three-dimensional Geometry

Coordinates axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit-XV 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.