

Syllabus of M.A/M.Sc. (Mathematics) Semester I

PAPER I (MAT CC 01)

Abstract Algebra

Abstract Algebra

Prerequisites: Introduction to Group, Elementary Properties of Group, Finite Group,

and subgroup, Cyclic Group, Permutation Group, Properties of Permutations, rings, integral Domains, Characteristic of rings.

Unit 1: Homomorphism; Group actions, Sylow theorems, Normal and subnormal series composition series of a group, Jordan-Holder Theorem, Solvable groups, commutator subgroup of a group, Nilpotent groups

Unit 2: Ring homomorphism, isomorphism, quotient rings, ideals, Kernel of ring homomorphism, principal ideal ring and domain, prime and maximal ideal, Euclidean domain.

Unit 3 : Extension fields , algebraic and transcendental extension, splitting field of Polynomial, separable and inseparable extension, normal extension, constructible real numbers.

Unit 4 : Cyclic Modules, simple Modules, semi-simple Modules, Schur's Lemma, Free Modules.

Unit 5: Solution of equations by radicals, insolvability of equations of degree 5 by radicals.

References :

1. I. N. Herstein :- Topics in Algebra.
2. M. Artin :- Algebra
3. L. S Luther & I. B. S Passi :- Algebra Vols I & II Narosa Publication House
4. D. S. Dummit and R. M. Foote :- Abstract Algebra
5. N. S. Gopalakrishnan :- University Algebra

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PAPER II (MAT CC- 02)

Real Analysis

Real Analysis

Unit 1: Sequences and series of functions, pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass-M test, Abel's and Dirichlet's test for uniform convergence.

Unit 2: Uniform convergence and differentiation, Weierstrass approximation theorem
Power series, Uniqueness theorem for power series, Abel's and Tauber's theorem.

Unit 3 : Definition and examples of Riemann-Stieltje's integral Property of integral,
Integration and differentiation, the fundamental theorem of Calculus, Integration
Of vector valued function, rectifiable curves.

Unit 4 : Functions of several variables, linear transformation, Derivatives in an open subset
of R^n , chain rule, partial derivatives, interchange of order of differentiation,
derivative. of higher orders, Taylor's theorem.

Unit 5 : Inverse function theorem, Implicit function theorem, Jacobians, Extremum
Problems with constraints, Lagrange's multiplier methods, differentiation of
Integrals, partition of unity, Differential forms, Stoke's theorem.

References :

1. W. Rudin :- Principles of Mathematical Analysis
2. T. M. Apostol :- Mathematical Analysis
3. I.P. Natanson :- Theory of function of Real Variable
4. H.L. Royden :- Real Analysis

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PAPER III (MAT CC-03)

Linear Algebra

Linear Algebra

Unit 1: Finite dimensional vector spaces; Linear transformations and their matrix representations, rank; systems of linear equations, eigenvalues and eigenvectors, minimal polynomial, Cayley-Hamilton Theorem, diagonalization

Unit 2: Hermitian, SkewHermitian and unitary matrices; Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, self-adjoint operators.

Unit 3 : Similarity of linear transformations, Invariant subspaces, reduction to triangular forms, Nilpotent transformations, Index of Nilpotency, invariants of a Nilpotent transformations, primary decomposition theorem, Joardan blocks and Jordan forms rational canonical form

Unit 4 : Bilinear form, algebra of bilinear form Matrix of bilinear forms, degenerate and Non-degenerate bilinear forms, Alternating bilinear forms

Unit 5: Symmetric and Skew-symmetric bilinear forms, Quadratic form, law of Inertia, Sylvester's theorem, Hermitian forms definite forms.

References :

1. K.B.Datta:- Matrix and Linear Algebra
2. S. Lipschutz:- Linear Algebra, Schaum's outline series
3. Hoffman and Kunze:- Linear Algebra

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PAPER IV (MAT CC-04)

Discrete Mathematics

Discrete Mathematics:

Graph Theory

Unit 1 : Definition of graphs , paths, circuits and subgraphs, induced subgraphs, degree of a vertex, connectivity, planar graphs and their properties, Trees and simple applications of graphs.

Lattice Theory

Unit 2 : Lattices as partially ordered sets and their properties, lattices as algebraic system, Sub lattices, direct products and Homomorphisms of Lattices some special lattices eg Complete lattices, complemented lattices and distributive lattices.

Boolean Algebra

Unit 3 : Boolean algebra as a complemented distributive lattice, Boolean rings, identification of Boolean algebra and Boolean rings, sub-algebra and generators.

Unit 4 : Boolean homomorphism and ring homomorphism ideals in a Boolean algebra and Dual ideals, Fundamental theorem of homomorphism and Stone's representation theorem for Boolean algebras and Boolean rings, simple application to electrical network, solvability of Boolean equations and logical puzzles.

Combinatorics

Unit 5 : Permutation and combinations, partitions, pigeonhole principle, inclusion-exclusion principle, generating functions, recurrence relations.

References :

1. K.H. Rosen :- Discrete Mathematics and its applications.
2. S. Lipschutz and M. Lipson :- Discrete Mathematics
3. C. L. Liu:- Elements of Discrete Mathematics
4. E.Mendelson :- Boolean Algebra and Switching Circuits
5. Kolman, Bushi and Ross :- Discrete Mathematical Structure

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