

## M.Sc. (Previous) – Mathematics

### Paper – I : Advanced Algebra

- Unit – 1. Direct products of groups (external and internal).
- Unit – 2. Isomorphism theorems; Conjugacy and the class equation of a group.
- Unit – 3. Commutators, Derived subgroups, Solvable groups, Subnormal series and Refinement theorem, Composition series and Jordan-Holder Theorem.
- Unit – 4. Euclidean rings : Division in commutative rings, Units, Associates and Prime elements, Unique factorization domain.
- Unit – 5. Modules, Submodules, Quotient modules, Direct sums, Module homomorphisms, Generation of modules, Cyclic modules.
- Unit – 6. Linear transformation of vector spaces, Dual spaces, Dual basis and their properties, Dual maps.
- Unit – 7. Basic theory of field extensions, Simple field extension, Algebraic and Transcendental extensions.
- Unit – 8. Splitting fields, Normal extension, Separable and Inseparable extensions, Automorphism of extensions.
- Unit – 9. Galois theory : Galois extension and Galois group, Fundamental theorem of Galois theory, Extensions by radicals and solvability, Insolvability of the quintic.
- Unit – 10. Matrices of linear maps of composite maps and of dual maps.
- Unit – 11. Rank and Nullity of linear maps and matrices, Invertible matrices, Eigen values and Eigen vectors, Change of basis and similar matrices.
- Unit – 12. Determinants of matrices and their properties, Existence and Uniqueness of determinants, Characteristic polynomial and Eigen values.
- Unit – 13. Real Inner product space, Schwartz's inequality, Orthogonality, Pythagoras theorem, Gram-Schmidt orthogonalization.
- Unit – 14. Bessel's inequality, Parseval's identity, Direct Sum, Adjoint of a linear map, Self-adjoint linear maps and matrices.
- Unit – 15. Orthogonal linear transformation and matrices, Principal axis theorem.

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