

Semester	6
Course	Minor-2
Paper Code	
Paper Title	Algebra-2 & Analysis-2
No. of Credits	4
Theory / Practical / Composite	Theory
Minimum No. of preparatory hours per week a student has to devote	4
Number of Modules	Nil
Syllabus	Algebra-2 [30]: Matrices & Determinants [15]: Trace of a square matrix –its basic results, Symmetric and skew-symmetric matrices, Orthogonal, Unitary & Hermitian matrices, their properties and related problems (5). Product of two determinants, Adjoint, Symmetric and skew-symmetric determinants & their properties (3). Laplace's expansion method for fourth-order determinants (1). Elementary Row Operations on a matrix, Row Echelon form, rank of a matrix, finding inverse of a matrix using elementary row operations (3). Consistency and solution of a system of linear equations with not more than three variables by matrix method, Cramer's rule (3). Introduction to Group Theory [15]: Binary operations, commutativity, associativity, existence of identity and inverse elements, examples (3). Definition of group, examples of infinite and finite groups (3). Elementary properties of groups and related problems (3). Definition & examples of a subgroup, statement of necessary and sufficient conditions of being a subgroup, and its applications (2). Elementary ideas of Ring & Field as prerequisites to Vector space (4). Analysis-2 [22]: Continuity of real-valued functions [10]: Continuity of a function at a point and in an interval, Different kinds of discontinuities (3). Acquaintance (no proof) with the important properties of continuous functions on closed and bounded intervals (5), Statement of existence of inverse function of a strictly monotone function and its continuity (2). Derivative [6]: LHD & RHD, Sign of derivative, monotone increasing and decreasing functions, Relations between continuity and derivability (3), Successive derivatives, Statement of Leibnitz Theorem and its applications (3).

	Improper integrals [6]: Definition, statement of μ-test and comparison tests-simple applications only (3). Use of Beta and Gamma functions (convergence and useful relations being assumed) (3).	
Learning Outcomes	On successful completion of the course, a student will be able to do the following: • Work with different classes of matrices and determinants, including symmetric, skew-symmetric, orthogonal, unitary, and Hermitian matrices, and apply their properties to solve related problems. • Apply methods such as Laplace expansion, adjoint, and elementary row operations to compute determinants, find rank, and determine the inverse of a matrix. • Solve systems of linear equations using the matrix method and Cramer's rule, and analyse consistency conditions. • Understand the basic concepts of group theory, including binary operations, properties of groups, subgroups, and examples of finite and infinite groups, along with introductory ideas of rings and fields as a foundation for vector spaces. • Develop a rigorous understanding with continuity and types of discontinuities, and properties of continuous functions on closed intervals. • Relate continuity and differentiability, analyse monotonicity, apply successive derivatives, and use Leibniz's theorem in problem solving. • Evaluate improper integrals using μ-test and comparison test, and apply properties of Beta and Gamma functions to definite integrals.	
Reading/Reference Lists	1. Introduction to Real Analysis: Bartle & Sherbert. 2. Calculus (Vol-1): T.M.Apostol. 3. Mathematical Analysis: Malik & Arora. 4. Classical Algebra: S.K.Mapa. 5. Higher Algebra: Abstract and Linear: S.K. Mapa. 6. An Introduction to Analysis (Differential Calculus (Part-1)): Maity & Ghosh.	
Evaluation	End Sem: 70 CIA:30(20(Mid-Sem) +5(Assignment)+5(Attendance))	
Paper Structure for	7 questions each carrying 10 marks out of 13/14 questions.	

Theory Exam	Semester
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