

DEPARTMENT OF MATHEMATICS
LESSION PLAN
SESSION 2023-24
SEMESTER – I

NAME OF TEACHER: HARICHARAN MAHANTA

PAPER ALLOTTED: MA-1 (ALGEBRA)

Month	Paper	Topic	No of classes
August 2023 (08.08.2023)	MA-1	Unit -1 : Classical Algebra De-Moivre's theorem for integer and rational indices and their applications, The n-th roots of unity. Definitions of exponential and trigonometrical functions of a complex variable, Logarithm of a complex number and its properties, Definitions of , Inverse circular functions, hyperbolic functions.	8
September 2023	MA-1	Unit-1 : Relation between roots and coefficients, Transformation of equation, Equation of squared differences of a cubic, reciprocal equations, Binomial equations and their properties, Descartes' rule of signs, Upper bounds for the real roots; Cardan's solution of the cubic and the nature of the roots of the cubic, Ferrari's methods of solution of biquadratic equations.	14
October 2023	MA-1	Unit-1: The inequality involving $AM \geq GM \geq HM$, Extreme values of sum and product, theorem of weighted means, Cauchy's inequalities, m-th power theorem.	8
		PUJA VACATION (19.10.2023 to 15.11.2023)	
November 2023		Class tests	
December 2023		Class for Slow Learners	4
January 2024		Internal Examination (18.01.2024 to 20.01.2024)	4
April, 2024		End Semester Examination	
		Total Classes	38

NAME OF TEACHER: DR. KUSUMIKA KUNDU

PAPER ALLOTTED: DS-1 (ALGEBRA)

Month	Paper	Topic	No of classes
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August 2023 (08.08.2023)	DS-1	Unit -1 : Classical Algebra De-Moivre's theorem for integer and rational indices and their applications, The n-th roots of unity. Definitions of exponential and trigonometrical functions of a complex variable, exponential values of sine and cosine. Periods of exponential and trigonometrical functions, Logarithm of a complex number and its properties, Definitions of , Inverse circular functions, hyperbolic functions, along with exercises of all these concepts.	10
September 2023	DS-1	Unit -1 : Classical Algebra General properties of polynomials and polynomial equations, Fundamental theorem of algebra(statement only). Relation between roots and coefficients, Transformation of equation, Equation of squared differences of a cubic and the nature of the roots of a cubic, reciprocal equations, Binomial equations and their properties, special roots of $x^n = 1$, Descartes' rule of signs, Upper bounds for the real roots; Theorems on imaginary, integral and rational roots; Newton's method for integral roots,	12
October 2023	DS-1	Unit – 1 Cardan's solution of the cubic and the nature of the roots of the cubic, Descartes' and Ferrari's methods of solution of biquadratic equations, Sturm's theorem(statement only) and its applications. The inequality involving $AM \geq GM \geq HM$, Extreme values of sum and product, theorem of weighted means, Weierstrass' & Cauchy's inequalities, m-th and generalized m-th power theorems.	8
PUJA VACATION (19.10.2023 to 15.11.2023)			
November 2023		Class tests	
December 2023	Class for Slow Learners		6
January, 2024	Internal Examination (18.01.2024 to 20.01.2024)		6
April, 2024	End Semester Examination		
Total Classes			42

NAME OF TEACHER: DR. ABUL KALAM MONDAL

PAPER ALLOTTED: DS-1 (ALGEBRA)

Month	Paper	Content	No of classes
August 2023 (08.08.2023)	DS-1	Unit -2 : Number Theory Equivalence relations and partitions, Functions, Invertible functions, One to one correspondence and cardinality of a set, Permutations, sign of a permutation, inversions, cycles and transpositions .	8
September 2023	DS-1	Unit -2 : Number Theory Well-ordering principle of non-negative integers, Principles of Mathematical Induction of	12

		positive integers, Division algorithm, Divisibility and Euclidean algorithm., g.c.d, Bezout's Theorem, Primes, Euclid's Lemma,	
October 2023	DS-1	Unit -2 : Number Theory Statement of Fundamental Theorem of Arithmetic, Euclid's proof of infinitely many primes, Congruence relation between integers, Euler ϕ function, Euler's theorem, Fermat's Theorem.	10
		PUJA VACATION (19.10.2023 to 15.11.2023)	
November 2023		Class tests	
December 2023		Class for Slow Learners	6
January, 2024		Internal Examination (18.01.2024 to 20.01.2024)	6
April, 2024		End Semester Examination	
		Total Classes	42

NAME OF TEACHER: SUMITA SAHA

PAPER ALLOTTED: DS-1 (ALGEBRA), MA-1 (ALGEBRA)

Month	Paper	Content	No of classes
August (08.08.2023)			
September 2023			
October 2023		Unit – 3 : Matrix Theory Matrix of real and complex numbers, Algebra of matrices (structure only); symmetric and skew symmetric matrices, Hermitian and skew- Hermitian matrices; Orthogonal and Unitary matrices.	8
		PUJA VACATION (19.10.2023 to 15.11.2023)	
November 2023	DS-1	Unit – 3 : Matrix Theory Determinants, Laplace expansions, cofactors, adjoint, inverse of a matrix, Cramer's Rule. Elementary row and Elementary column operations on matrices; elementary matrices; Echelon form; Triangular	12

		factorization of matrices: $A = LU$, $A = L D V$, $PA = LU$, $EA = R$; product of elementary matrices and inverse of a matrix.	
December 2023	DS-1	Unit – 3 : Matrix Theory Rank of a matrix; Determination of rank (relevant results are to be stated only); System of linear equations in matrix form $AX = B$; Consistency and inconsistency (by rank method); Types and determination of solution (by using notion of rank), Solving linear systems using Gaussian elimination, Gauss-Jordan row reduction, Reduced row echelon form, Equivalent systems. Eigenvalues, Eigenvectors of matrices and their examples and properties, Characteristic polynomial of a matrix, Cayley-Hamilton theorem and its application for determining inverse of square matrix.	14
January, 2024		Class for Slow Learners	8
January, 2024	Internal Examination (18.01.2024 to 20.01.2024)		
April, 2024	End Semester Examination		
Total Classes			42

Month	Paper	Topic	No of classes
August 2023 (08.08.2023)			
September 2023			
October 2023	MA-1	Unit – 2 : Abstract Algebra Equivalence relations and partitions, Functions, Composition of functions, Invertible functions, One to one correspondence and cardinality of a set. Permutations, inversions, cycles and transpositions. Definition and examples of groups, examples of abelian and nonabelian groups, the group Z_n of integers under addition modulo n and the group $U(n)$ of units under multiplication modulo n , groups of symmetries of an equilateral triangle, the permutation group S_3 , the general linear group $GL(n, R)$, $n \leq 3$.	10

	PUJA VACATION (19.10.2023 to 15.11.2023)		
November 2023	MA-1	Unit – 2 : Abstract Algebra: Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset, Cosets, Index of subgroup, Lagrange’s theorem and its converse, order of an element, Normal subgroups: their definition, examples, and characterizations. Definition and examples of rings, examples of commutative and non-commutative rings, Z_n, the ring of integers modulo n, polynomial rings, Definitions of Subrings, Integral domains, skew-fields, fields and subfields, their examples and elementary properties.	8
December 2023	MA-1	Unit – 3 : Linear Algebra Matrix of real and complex numbers, Algebra of matrices(structure only); symmetric and skew symmetric matrices, Hermitian and skew Hermitian matrices; Orthogonal and Unitary matrices. Determinants, Laplace expansions, cofactors, adjoint, inverse of a matrix, Cramer`s Rule. Vector space, Linearly dependent and independent set, Basis, Dimension. Linear Transformation and their elementary properties and examples, Matrix representation of Linear Transformation.	12
January 2024	MA-1	Unit – 3 : Linear Algebra Rank of a matrix; Determination of rank (relevant results are to be stated only); System of linear equations in matrix form $AX = B$; Consistency and inconsistency (by rank method); Types and determination of solution (by using notion of rank), Solving linear systems using Gaussian elimination. Eigenvalues, Eigenvectors, Eigenspace, Diagonalization of matrices, Characteristic polynomial of a matrix, Cayley-Hamilton theorem and its application for determining inverse of square matrix . Bilinear forms, real quadratic. forms Sylvester`s law of inertia, positive definiteness.	10
January, 2024	Internal Examination (18.01.2024 to 20.01.2024)		
April, 2024	End Semester Examination		
		Total Classes	40