

Lesson Plan of Paper : Algebra and Number Theory

Session: 2023-24.

Name of Teacher: Dr. Ruchika

Class: BSc. /BA/B.A Hons. 1st year Sem. 2nd

Week	Topics
Week 1	Matrices and their types Examples based on matrices Symmetric matrices and their theorem Skew symmetric matrices and their theorem Theorems based on above method
Week 2	Orthogonal and unitary matrix Theorems based on above method Rank of a matrix Row rank and column rank Examples based on rank method
Week 3	Normal form of a matrix Problems based on above method Reduction of matrix into row echelon form Inverse of a matrix using elementary operations Examples based on above method
Week 4	Linear dependence and independence of row and column matrices Theorem related to linear independent and linear dependent Characteristic equation of a matrix Theorems based on above method Linear dependence and independence of row and column matrices
Week 5	Eigen values and eigen vectors of a matrix Cayley Hamilton theorem Problem based on this theorem Inverse of a matrix using Cayley Hamilton theorem Eigen values and eigen vectors of a matrix
Week 6	Minimal and monic polynomial Theorems Derogatory and non Derogatory matrices Examples based on these topics
Week 7	Relation between roots and coefficients of an equation Synthetic division method Problems and examples on above method Fundamental theorem of algebra Theorems and examples based on above problem

Week 8	Problems and examples on root of an equation Results on common root Problems on common root Assignment -1
Week 9	Transformation of Equations Roots with signed changed ,roots multiplied by a given number and reciprocal roots Problems based on above method Roots diminish by a given number Transformation of Equations
Week 10	Problems based on above method Transformation of equations in general Equation of squared difference of a cubic Descartes rule of sign Results on Descartes rule of signal Problems on results
Week 11	Linear Congruences Examples Fermat's theorem Examples Euler's theorem
Week 12	Examples based on Euler's and Wilson's theorem Test Linear Diophantine equations in two variables Complete residue system, Reduced residue system modulo m Examples. Assignment-2
Week 13	Query Revision

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Lesson Plan of Paper: Groups and Rings

Name of Teacher: Dr. Ruchika

Class: B.A/B.Sc.-IIIrd, Sem-5th

Week 1	Binary operations & its properties
	Group & its examples
Week 2	General properties of groups and theorems
	Order of an element of a group and theorems
	Examples & Exercise
	Subgroups & theorems
Week 3	Theorems
	Examples & Discussion of Exercise
	Cyclic groups & theorems
	Theorems
Week 4	Examples & Discussion of Exercise
	Cosets & theorems
	Examples
	Relation of congruence modulo of a subgroup in a group
	Lagrange's Theorem
Week 5	Examples & Exercise
	Normal subgroups & theorems
	Quotient group
	Example & Exercise
	Assignment-1
Week 6	Homomorphisms and Isomorphisms of groups
	Kernel of homomorphisms
	Fundamental theorem on homomorphism of groups
	Second and third theorem of isomorphism
	Automorphism of a group
Week 7	Theorems & examples
	Inner Automorphism
	Theorems & examples
	Centre of group
	Characteristic subgroups
	Exercise
Week 8	Normalizer (Centralizer) of an element
	Commutator, Derived Group
	Permutation groups
	Examples

Week 9	Cyclic permutation, Alternating Group, Cayley Theorem
	Examples & Exercise
	Problems
	Test-1
	Rings and examples
	Ring with or without zero divisors
Week 10	Integral domain, Divison ring, field
	Theorem and Examples
	Exercise
	Sub rings, Centre of a ring & example
	Characteristic of a ring
	Theorems and Exercise
Week 11	Assignment-2
	Ideals
	Theorems
	Simple ring & theorems
	Principal ideal, unity , zero ideal, PID
	Maximal, prime ideal
Week 12	Quotient rings
	Examples and Exercise
	Ring homomorphisms
	Fundamental theorem of homomorphism
Week 13	First and Second theorem of isomorphism
	Theorems and examples
	Embedding of rings, field of quotients of an I.D.
	Example and Exercise
Week 14	Unit element, prime element, irreducible element
	Proper and improper divisors, GCD, LCM, E.D.
	P.I.D.
Week 15	Theorems
	Examples and Exercise
	Polynomial rings
Week 16	Polynomial over field
	Eisenstein's criterion, UFD
	Problems
	Test