C3.2 : Group Theory-II and Linear Algebra-I

Theory Paper, Full Marks: 100, Total Credit:6=5+1(Th+Tutorial), No. of classes per week:6(=5+1)

Paper Code: HMTCR3061T

Module-I: Group Theory-II (39 classes)

Course Objective: *To learn the constructions of new group from the old, group transformations, classification of groups through group transformations***.**

Normal subgroups, Quotient group - Examples, **(5)** Cauchy's Theorem for finite abelian groups (2). Homomorphism and Isomorphism of group--definition and examples **(5)** Homomorphism theorems relating to identity, inverse, image and inverse image of a subgroup, order of an image of an element **(3)**. Kernel of a homomorphism—related results **(2)**. Monomorphism, epimorphism, isomorphism—related results; isomorphic class of a group, examples **(3)** .Infinite cyclic group is isomorphic to (Z,+) and finite cyclic group is isomorphic to(Z_n,+), Cayley's theorem on finite groups and its applications (**4**).

Natural homomorphism of G onto G/N, N being a normal subgroup of G. First, Second and Third Isomorphism Theorems **(5)**. Isomorphism results relating to normal subgroups (**2)**. Normalizer, Centralizer, Center of a group, Product of Subgroups, External direct product of a finite number of groups and their applications (8)

References:

(1) First Course in Abstract Algebra— J. B. Fraleigh
(2) Abstract Algebra—D.S. Dummit and R. M. Foote
(3) Algebra—M. Artin
(4) Topics in Algebra—I. N. Herstein
(5) Topics in Abstract Algebra—M. K. Sen, S. Ghosh, P. Mukhopadhyay
(6) Elementary Linear Algebra—Howard Anton, Chris Rorres

Module-II: Linear Algebra -I (39 classes)

Course Objective: *Learning Abstract Vector Spaces, Linear Transformations and their salient properties***.**

Recapitulations of vector space structure on$\mathbb{R}^n$. Vector spaces, subspaces **(6)**, algebra of subspaces, quotient spaces **(3)**, linear combination of vectors, linear span, linear independence **(4)**, basis and dimension, dimension of subspaces. Infinite dimensional vector spaces : only examples **(4).**

Linear transformations, null space, range, rank and nullity of a linear transformation **(4)**, matrix representation of a linear transformation **(2)**, algebra of linear transformations. Isomorphisms. Isomorphism theorems, invertibility and isomorphisms, properties of isomorphism **(6)** change of coordinate matrix **(2).** Solving problems of matrices by the use of linear transformations, rank-nullity theorem (2).

Row space and column space of a matrix. Row rank, column rank, determinant rank and their equality. Rank of product of two matrices **(6)**

References:

1. Linear Algebra-K. Hoffman and R. Kunze
2. Linear Algebra: Insel, Friedberg, Spance.
3. Elementary Linear Algebra—Howard Anton, Chris Rorres
4. Introduction to Linear Algebra: Gilbert Strang
5. Linear Algebra — S. K. Mapa
6. Linear Algebra- K. B. Datta