M.Sc (Semester2) ---- 1

MA 5320 Algebra I

Group Theory: Review of basic Group Theory, Group Actions, Kernel and Stabilizer of Group Actions, Transitive Group Action, Cayley's Theorem, The Class Equation, Sylow's Theorems, Direct Products, Structure Theorem for Finite Abelian Groups, Existence and universal Properties of free Groups, Examples of Groups specified by Generators and Relations.
Ring Theory: Review of basic Ring Theory, Properties of Ideals, Prime and Maximal Ideals, Two-sided ideals and Quotient Rings, Chinese Reminder Theorem, Euclidean Domain, Euclidean Algorithm, Principal Ideal Domain, Euclidean Domain is a Principal Ideal Domain, UFD, PID implies UFD, Universal Property of a Polynomial Ring, Criteria for Irreducibility. Definition and simple examples of modules over commutative and non-commutative rings.
Field Theory: Finite and Algebraic Extensions, Existence and Cardinality of Algebraic Closure, Finite Fields, Galois Theory of Polynomial in characteristic zero and simple examples.

References :

Text Books:
1. D. S. Dummit and R. M. Foote: Abstract Algebra, 2nd Edition, John-Wiley, 1999.
2. S. Lang: Algebra 3rd Edition, Addison-Wesley, 1999.
Reference:
1. J.A. Gallian: Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.
2. M. Artin: Algebra, Prentice Hall inc 1994.
3. I.N. Herstein: Topics in Algebra, John-Wiley, 1995.
4. T. A. Hungerford: Algebra, Graduate Texts in Mathematics, Vol. 73, Springer-Verlag, 1980.

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MA 5380 Topology

Topological Spaces, Basis for a topology, Subspace topology, Closed sets and Limit points, Nets and convengence, Continuous Functions and homeomorphisms, Product Topology, Quotient Topology.
Connected spaces, Components and Local Connectedness, Path connectedness, Compact spaces, Local compactness, Compactifications.
The Countability and Separation axioms, The Urysohn Lemma, The Urysohn Metrization Theorem, The Tietze Extension Theorem, Tychonoff Theorem.

References :

Text Books:
1. J.R. Munkres, Topology, 2nd Ed., Pearson Education India, 2001.
2. K.D. Joshi, Introduction to General Topology, New Age International, New Delhi, 2000.
Reference:
1. J.V. Deshpande, Introduction to Topology, Tata McGraw-Hill, 1988.
2. J. Dugundji, Topology, Allyn and Bacon, Inc. 1966.
3. J.L. Kelley, General Topology, Van Nostrand, , 1955.
4. M.G. Murdeswar, General Topology, New Age International, 1990.
5. G.F. Simmons, Introduction to Topology and modern Analysis International Student edition,

1963.
6. S. Willard, General Topology, Addison Wesley, Reading Mass., 1970.

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MA 5340 Measure and Integration

Unit I: Review of Riemann Integral, Riemann-Stieltjes Integral.
Unit II: Lebesgue Measure; Lebesgue Outer Measure; Lebesgue Measurable Sets.
Unit III: Measure on an arbitrary sigma -Algebra; Measurable Functions; Integral of a Simple Measurable Function; Integral of Positive Measurable Functions.
Unit IV: Lebesgue's Monotone Convergence Theorem; Integrability; Dominated Convergence Theorem; Lp - Spaces. Differentiation and Fundamental theorem for Lebesgue integration.
Unit V: Product measure; Statement of Fubini's theorem.

References :

Text Books:
1. G. de Barra: Measure and Integration, Wiley Eastern, 1981.
2. H.L. Royden: Real Analysis, Third edition, Prentice-Hall of India, 1995.(Chapter 3, Sections 1-5)
3. W. Rudin: Real and Complex Analysis, Third edition, McGraw-Hill,International Editions, 1987. (Chapters 1, 3)
Reference:
1. I.K. Rana: An Introduction to Measure and Integration, Second Edition,Narosa, 2005.
2. D.L. Cohn: Measure Theory , Birkhauser, 1997.
3. P.K. Jain and V.P. Gupta: Lebesgue Measure and Integration, New Age International, 2006.

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MA 5920 Partial Differential Equations

First order partial differential equations: Linear, quasi-linear and fully nonlinear equations- Lagrange and Charpit methods.
Second order partial differential equations: Classification and Canonical forms of equations in two independent variables, One dimensional wave equation- D'Alembert's solution, Reflection method for half-line, Inhomogeneous wave equation, Fourier Method.
One dimensional diffusion equation: Maximum Minimum principle for the diffusion equation, Diffusion equation on the whole line, Diffusion on the half-line, inhomogeneous equation on the whole line, Fourier method.
Laplace equation: Maximum -Minimum principle, Uniqueness of solutions; Solutions of Laplace equation in Cartesian and polar coordinates-Rectangular regions, circular regions, annular regions; Poison integral formula
Diffusion and wave equations in higher dimensions.

References :

Text Books:
1. Ioannis P Stavroulakis and Stepan A Tersian, Partial differential equations- an introduction with mathematica and maple, world - Scientific, Singapore, 1999

References:
1. Jeffery Cooper, Introduction to partial differential equations with matlab, Birkhauser, 1998
2. Clive R Chester, Techniques in partial differential equations, McGraw-Hill, 1971
3. K Sankara Rao, Introduction to partial differential equations, Prentice Hall India,1997
4. I. N. Sneddon, Elements of partial differential equations, McGraw-Hill, New York,1986
5. W. E. Williams, Partial differential equations, Clarendon Press, Oxford, 1980.

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MA 5360 Complex Analysis

Unit I: Topology of the complex plane, Riemann sphere, limits, continuity and differentiability, Analytic functions, harmonic functions and multi-valued functions.
Unit II: Convergence of numerical series, Radius of convergence of power series, and power series as an analytic function, Laurent series.
Unit III: Cauchy's integral theorem, Cauchy integral formula, Morera's theorem, Taylor`s theorem, Laurent's theorem, Liouville's theorem, Schwarz lemma; Maximum Modulus Principle.
Unit IV: Conformal mappings, linear fractional transformations, Classification of singularities, Cauchy's residue theory and evaluation of real integrals.

References :

Text Books:
1. S. Ponnusamy and H. Silverman: Complex Variables with Applications, Birkhauser, Boston, 2006.
2. J.B. Conway: Functions of one Complex Variables, 2nd edition, Springer-Verlag, 1978.
Reference:
1. S. Ponnusamy: Foundations of Complex Analysis, Second Edition, Narosa Publishing House, 2005
2. L. Ahlfors: Complex Analysis, 2nd ed., McGraw-Hill, New York, 1966.
3. J.W. Brown and R.V. Churchil, Complex Variables and Applications, McGraw Hill, 2008
4. T.W. Gamelin: Complex Analysis, Springer-Verlag, 2001.