M.A./M. Sc. (Evening) Mathematics Previous Year

S. No.	Papers	Internal Assessment	Theory	Practical	Total
1.	Analysis	25	75	-	100
2.	Linear Algebra	25	75	-	100
3.	Mechanics	25	75	-	100
4.	Topology	25	75	-	100
5.	Theory of Differential Equations	25	75	-	100
6.	Introduction to Computers and Programming Fundamentals	25	75	50	150
Total					650

Paper I Analysis

Unit 1   Countability of sets. Lebesgue Measure on the real line, Length of intervals, Open and Closed sets on real line. Outer and Inner Lebesgue measure, Lebesgue measurable sets, Properties of measurable sets, Algebra, _-algebra and Borel sets and their measurablity, Non-measurable sets, Canter's Ternary sets and their properties.

Unit 2   Measurable functions, Characteristic function, Step function, Continuous function, Set of measure zero, Borel measurable function, The structure of measurable function.

Unit 3   Riemann integral and its difficiency, Lebesgue integeral of bounded function, Comparision of Riemann and Lebesgue integerals, Properties of Lebesgue integeral for bounded measurable function, The Lebesgue integeral for unbounded functions, Integeral of non-negative measurable functions, General Lebesgue integeral, Improper integeral.

Unit 4   Pointwise convergence, Convergence almost everywhere, Uniform Convergence almost everywhere, Convergence in measure, F. Reisz's Theorem on Convergence a.e., D.F. Egoroff's Theorem, Lebesgue Bounded Convergence Theorem, Lebsgue Dominated Convergence Theorem, Fatou's Lemma, Monotone Convergence Theorem.

Unit 5   Dini Derivatives, Differentiation of Monotone Functions, Functions of Bounded Variation, Differentiation of an Integral, Lebesgue sets, Absolute Continuous Functions, Integral of the Derivatives. Lp-space, Normed space, Properties of Lp-space, Lp-space as a normed space, Holder's inequality, Minkowski's inequality and Schwartz's inequality, Convergence in the mean, Cauchy's sequence in the Lp-spaces, Riesz-Fischer Theorem. Bounded Linear functionals of Lp-spaces.

Text Books:

1.   Royden, H.L. : Real Analysis (2nd ed.)
      The Macmillan Co., New York (1968)

2.   Jain, P.K., Gupta : Lebesgue measure and Integeration
      Willey Eastern Ltd., New Age Int.
      Ltd., New Delhi, (1994).

Paper 2 Linear Algebra

Unit 1   Linear transformation, Rank and nulity of a linear transformation, Sylvester's Law of nulity, Subspaces, Quotient spaces, Schauder basis.

Unit 2   Algebra of Linear transformations, Orthogonal and Supplementary linear transformations, Dual space, Linear functional, Bidual, Cannonical isomorphism.

Unit 3   Matrix of a linear transformation, Change of Basis, Equivalent and similar matrices, Minimal polynomials, Invertible linear transformation.

Unit 4   Eigen values, Eigen vectors, More on maximal polynomials, Diagonal vectors of a square matrix, Jordan Block, Jordan Cannonical form, Cyclic linear transformation, Cyclic spaces, Jordan normal form.

Unit 5   Trace and transpose of a linear transformation, Adjoint, Hermitian Adjoint, Unitary and Normal linear operators.

Books Recommended
1.   I.N. Herstein : Topics in Algebra

References:
1.   P.R. Halmos : Linear Algebra with Problems.
2.   Hoffman & Kunze : Linear Algebra
3.   Krishnamurthy : An introduction to Linear Algebra
4.   Surjeet Singh : Modern Algebra

Paper 3 Mechanics

Unit 1   Moments of inertia, Kinetic energy, Angular momentum.

Unit 2   Mechanics of a particle and system of particles, kinematics of a rigid body, Euler's angles.

Unit 3   Euler's dynamical equations, two dimensional motion of a rigid body, Compound pendulum, Contraints.

Unit 4   D'Alembert's principle, Lagrange's equations of motion, Techniques of calculus of variations.

Unit 5   Hamilton's principles, Hamilton's equations of motion, Contact transformation, Lagrange's and Poison brackets, Integral in variances, Hamilton-Jacobi Poisson equations.

References
1.   Principle of Mechanics: Singe and Griffith.
2.   Lectures in Analytical Mechanics: F. Gantamacher.
3.   Ele.Treatise on the dynamics of particle and rigid bodies: S.L. Loney.
4.   A Text Book of Dynamics: F. Choelton.
5.   An introduction to the Calculus of Variation: C. Fox.
6.   Calculus of Variations: R. Weinstock.

Paper 4 Topology

Unit 1   Definition and examples, Open and closed spheres, Open and closed sets, Convergence, Completeness, Cantor's intersection Theorem, Dense sets and separable spaces, Baire's Category Theorem, Continuous mappings, Uniform continuity.

Unit 2   Definition and examples, neighbourhood system of a point, Limit points, Closed sets, Closure, Interior and boundary, Bases and sub bases, Continuity, Homeomorphism, Subspaces and product spaces, Local base, First and second countable spaces, Separable spaces, Lindelof's theorem.

Unit 3   Definition and examples, Finite intersection property, Heine Borel theorem, Locally compact spaces, Sequential compactness, Bolzano Weierstrass property, Lebesgue covering lemma, Total boundedness.

Unit 4 T_i ($i = 0,1,2,3,4$) spaces, Regular and Completely Regular spaces, Normal and Completely Normal spaces.

Unit 5   Connected spaces, Components, Locally connected spaces, Totally connected spaces, Totally disconnected spaces, Pathwise connectivity.

Books Recommended

1.   G.F. Simmons :Introduction to Topology and Modern Analysis
(Chapter II 9-13,16-19 IV 21,22,24 V 26,27 VI 31-34)

2.   BenjaminT.Sims :Fundamentals of Topology. (relevant portions only)

3.   B. Mendelson :Introduction to Topology (Chapters II,III,IV,V) (relevant portions only)

Reference Books

4.   J.L. Kelley: General Topology.

5.   W.J. Pervin: Foundations of General Topology.

6.   J.R. Munkres: Topology

Paper 5 Theory of Differential Equations

Unit 1   Existence & uniqueness theorem, General theory of homogenous and non-homogenous equations with constant coefficients, Theory of equations with variable coefficients, Method of variation parameter and the formula for particular integral in terms of Wronskian.

Unit 2   Series Solution of Second order linear differetial equations near ordinary point, Singularity and the solution in the neighbourhood of regular singular point, Euler equation and Frobenious method, Solution of Legendre, Bessel, Hypergeometric, Hermite and Lagurre differential equation.

Unit 3   Formulation of Heat conduction equation and its solution by variable sepration method, Steadystate condition and the solution of heat conduction problem with non-zero end conditions. Formation of Wave equation and the solution of Wave equation.

Unit 4   Linear homogeneous Boundary Value Problems, Eigen values and Eigen functions, Sturm-Liouville Boundary Value Problems, Non-homogeneous Boundary Value Problems, Non-homogeneous heat conduction problems.

Unit 5   Green's functions and the solution of Boundary Value Problems in terms of Green's functions, Concept of stability, asymptotic stability and instabilty of a solution of the autonomous system $dx/dt = F(x,y)$, $dy/dt = G(x,y)$

References

1.   An Introduction to Ordinary Differential Equation: Earl A. Coddington
2.   Elementary Differential Equations and Boundary Value Problems: Boyce and Diprime.
3.   A first course in partial differential equations: E. Weinberger

Paper 6 Introduction to Computers and Programming Fundamentals

Unit I   Introduction to computers, types of computers, generation of computers, basic parts of computer : input, output, control, storage, arithmetic units; hardware, software, low level languages, high level languages.

Unit 2   Number systems, decimal, binary, octal, hexadecimal representation, fixed point representation, floating point representation, arithmetic computations using different number systems, algorithm, flowcharting.

Unit 3   Introduction to programming methodology, Procedures and computation, Capturing procedural abstraction, Capturing abstraction in data descriptors, Recursion, use of recursion in programming.

Unit 4   Modularity and reliable program design, Propositional and predicate calculus, use in programming and program verification, programming environment and higher level language, the listed concepts to be illustrated through two example programming languages, namely C.

Unit 5   Windows, Win95, MS word, MS Excel, MS Access, Word-processing, Electronic Spreadsheet, Database Management.

*Exposure to software packages in the above areas.