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

S. No.	Papers	Internal Assessment	Theory	Practical	Total
1.	Functional Analysis	25	75	-	100
2.	Complex Analysis	25	75	-	100
3.	Lattices and Module Theory	25	75	-	100
4.	Fluid Dynamics	25	75	-	100
5.	Differential Geometry	25	75	-	100
6.	Operating Systems & Object Oriented Programming	25	75	50	150
Total					650

Paper 7 Functional Analysis

Unit 1 Definition and examples, Incomplete normed spaces, Completion, Subspaces, Quotient spaces, Schauder basis.

Unit 2 Definition and examples, Relation between continuity and boundedness, Null space, Spaces of bounded linear operators, Equivalent norms, Open mapping theorem, Closed graph theorem, Uniform boundedness principle.

Unit 3 Definition and examples, Relation between continuity and boundedness, Dual spaces, Duals of R^n, C_n, $l^p(n)(1<p<\_)$,C_0, l^1 and lp $(1<p<\_)$, Hahn Banach theorem, Embedding and reflexivity, Adjoint operator, Weak and weak* convergence.

Unit 4 Definition and examples, Schwartz inequality, Parallelogram equality, Subspaces, Completion, Orthogonality of vectors, Orthogonal complement and projection theorem, Orthogonal sets and Fourier analysis, Complete orthogonal sets.

Unit 5 Bounded linear functionals, Riesz-Frechet theorem, Hilbert-adjoint operator, self-adjoint, Normal and Unitary operators, Orthogonal projection operators.

Books Recommended

1. P.K. Jain, O.P. Ahuja and Khalil Ahmad: Functional Analysis. New Age International (P), Ltd., NewDelhi (1995)
2. E.Kreyszig: Introductory Functional Analysis with Applications John-Wiley & Sons, N.Y. -1978

Paper 8 Complex Analysis

Unit 1 Representation of Complex Numbers , Analytic Function, Cauchy Riemann Equations, Powers Series, Some Elementary Functions, Harmonic Functions.

Unit 2 Properties of Line integral, Zeros of an analytic function, Cauchys Theorem, Cauchy's Integral formula, Cauchy's inequality, Fundamental Theorem of Algebra, Poison's formula, liouville's Theorem, Rouche's Theorem, The argument principle.

Unit 3 Residues and Poles, Classification of Isolated singularities, Taylor's and Laurant's Series, Winding Numbers and cauchy Residue Theorem.

Unit 4 Application of Residue Theorem in Evaluation of Improper real Integrals and Evaluation of Sum.

Unit 5 Conformal Mapping Properties, Schwarz Lemma Riemann Mapping Theorem (without proof), Maximum Modulus Theorem, Analytic Continuation.

References

1. Rudin : Real and Complex Analysis
2. J.B. Conway : Complex Analysis
3. Alhfors : Complex Analysis
4. E.C. Titchmarch : Complex Analysis
5. B. Chawdhary : Complex Analysis

Paper XII : Lattices and Algebras

Unit 1. Partially ordered set, Least upper bound, Greatest lower bound, Lattice, Sublattice, Their Characterizations, Ideals in a lattice, Properties of ideals.

Unit 2. Interval, Homomorphism, Isomorphism and its characterization, Zero and all elements in a lattice, Complete lattice, Modular and distributive lattices, Characterization of a modular lattice, Isomorphic, Similar and projective intervals.

Unit 3. Refinement of a chain, Schreier's refinement theorem, Jordan-Holder theorem. A.C.C, and D.C.C., Fundamental dimensionality relation for modular lattice, Decomposition theory for lattices with A.C.C., Independent (join) elements in a lattice & their properties, Complemented modular lattices, Points, Properties of complemented modular lattices with chain condition.

Unit 4. Distributive and complemented lattices, (Boolean Algebra), Boolean rings, Conversion of a Boolean algebras into Boolean rings and vice-versa. Algebras, Different types of algebras (Quarternions, Caley), Endomorphism, Derivation of a ring and algebras.

Unit 5. Lie ring, Lie ring endomorphism of an additive abelian group, Inner derivations, Inner derivation for associative rings and Lie rings, Homomorphism of a ring onto the Lie ring of inner derivations.

References:-

1. N. Jacobson,
   Lectures in Abstract Algebra
2. Medha & Medha,
   Lattice Theory
3. Grazer,
   General Lattice Theory
4. S. Birkhoff,
   Lattice Theory
5. Kuroosh,
   General Algebra

Paper 10 Fluid Dynamics

Unit 1 Ideal and Real fluids, Pressure, Density, Viscosity, Description of Fluid motion, o-Lagrangian method, Eulerian method. Steady and unsteady flows, Uniform and nonuniform flows, One dimensional, two dimensional and axisymmetric flows, Line of flows, Stream line Path line, Stream surface, Stream tube, Streak lines, Local and Material delivative, Equation of Continuity.

Unit 2 Euler's equation of Motion along a stream line, Equation of motion of an inviscid fluid, conservative field of force, Integral of Eulers equation, Bernoullis equation and its applications, flow from a tank through a small orifice, Cauchys integral, Symmetric forms of the equation of continuity, Impulsive motion of a fluid, Energy equation.

Unit 3 Dimenssional Analysis, Buckinghm's pi theorem, Variable in fluid mechanics, Procidures of dimensional Analysis, Similitude, Important dimension less perameter (Reynold's no., Mech No.,Prandtl,Pradtl No.etc.)

Unit 4 Navier-Stokes equation, Poseuelles equation for laminar flow in pipe, Stokes low for fall velocity, Darcyslaw, Some simple tipes of flows (Couette flow and its journalysation, Flow between two porous plates)

Unit 5 Boundary layer definition and it's characteristics, Leminar boundary layer, Separation and it's control, Similarity solution of boundary layer equation, Boundary layer flow over flat plate, Stagnation point and boundary layer flow near this.

Books Recommended

1. Introduction to fluid dynamics by R. K. Rathy
2. Hydrodynamics by Shanti Sawroop
3. Fluid Mechanics by R. J. Garde
4. Boundary layer Theory by H. Schlichting

Paper 11 Differential Geometry

Unit 1 Coordinate transformation, Covariant, Contravariant and mixed tensors, tensors of higher rank, symmetric and skew symmetric tensor, tensor algebra, Contraction, Inner Product, Quotient Law. Riemannian metric tensor, Christoffel symbols, Transformation Laws of Christoffel symbols, Covariant derivatives of higher rank tensor, Riemannian curvature tensor.

Unit 2 Differentiable curves and their parametric and implicit representations, Tangent vector, Principal normal, Binormal, curvature and torsion, Serret-Frenet formulas, Fundamental theorem for space curve. Vector fields, Covariant differentiations, Connexion forms and structural equations in E3.

Unit 3 Curvilinear Co-Ordinates on a Surface, First fundamental forms, Geodesic on surface, Geodesic co-ordinates.

Unit 4 Second fundamental forms, Tensor derivative, Gauss-Weingarten formulae, Integrability condition, Gauss & Mainardi Codazzi equations, Meusrier theorem, Geodesic curvature.

Unit 5 Line of curvature, Asymptotic lines, Gauss and mean curvature, Minimal surfaces, Third fundamental forms.

Books Recommended

1. Introduction to Differential Geometry: Abraham Goetz; Addison Wesley Pub. Company.
2. Differential Geometry: Nirmala Prakash; McGraw-Hill
3. Elementary Differential Geometry: B.O. Neill; Academic Press.
4. A course in tensors with Application to Riemannian Geometry: R.S. Mishra
5. An introduction to Differential Geometry: T.J. Willmore
6. Introduction to Riemannian Geometry and Tensor Calculus: Weitherburn

Paper 12 Operating Systems & Object Oriented Programming

Unit 1 The function of operating system, basic concepts, types of operating systems, batch processing, multiprocessing, multiprogramming, time-sharing.

Unit 2 Memory Management: partition, paging and segmentation, runtime storage allocation, Input/Output processor and data management, device management.

Unit 3 Introduction to Unix, structure and features of Unix system, application of Unix system, commands. Introduction to UNIX file system, simple file and directory commands of UNIX, file types and UNIX file system, security in UNIX, UNIX filters and pipes.

Unit 4 Basics of object oriented programming: objects, classes, instances, polymorphism: operator overloading.

Unit 5 C++ and C, C++ programming: basics, loops and dicisions, structures, functions, arrays, objects and classes, pointers.

Note:- Practicals in C++.

References

1. An Introduction to Operating Systems : Harvey M. Deitel, Addison-Wesley
2. A user guide to the Unix System : Rebecca Thomas, Jean Yates
3. Object Oriented Programming in Microsoft C++: Robert Lafore, Galgotia
4. Operating System Concepts Wesley Publ. Co : Peterson and Solsershatz Addison-2nd Ed.