Total Marks: 200
Paper - I (Marks: 100)
 Course Outline
Note: Candidates will he asked to attempt three questions from Section A and two questions from section B.
 SECTION A
Modern Algebra
Groups, subgroups, Lagranges Theorem, cyclic groups, normal sub groups, quotient groups, Fundamental theorem of homomorphism, Isomorphism theorems of groups, Inner automorphisms, Conjugate elements, conjugate subgroups, Commutator subgroups. Rings, Subrings, Integral domains, Quotient fields, Isomorphism theorems, Field extension and finite fields.

Vector spaces, Linear independence, Bases, Dimension of a finitely generated space, Linear transformations, Matrices and their algebra, Reduction of matrices to their echelon form, Rank and nullity of a linear transformation.

Solution of a system of homogeneous and non-homogeneous linear equations, Properties of determinants, Cayley-Hamilton theorem, Eigenvalues and eigenvectors, Reduction to canonical forms, specially diagonalisation.
 SECTION B
Geometry
Conic sections in Cartesian coordinates, Plane polar coordinates and their use to represent the straight line and conic sections, (artesian and spherical polar coordinates in three dimensions, The plane, the sphere, the ellipsoid, the paraboloid and the hyperbiloid in Cartesian and spherical polar coordinates.

Vector equations for Plane and for space-curves. They are length. The osculating plane. The tangent, normal and binormal, Curvature and torsion, Serre-Frenet's formulae, Vector equations for surfaces, The first and second fundamental forms, Normal, principal, Gaussian and mean curvatures,
 PAPER-II (Marks: 100)
Note: Candidates will be asked to attempt any three questions from Section A and two questions from Section B.
SECTION A
Calculus and Real Analysis
Real Numbers. Limits. Continuity, Differentiability. Indefinite integration. Mean value theorems. Taylor's theorem. Indeterminate forms. Asymptotes. Curve tracing. Definite integrals, Functions of several variables, Partial derivatives. Maxima and minima Jacobians, Double and triple integration (techniques only). Applications of Beta and Gamma functions. Areas and Volumes. Riemann-Stieltje's integral, Improper integrals and their conditions of existences, Implicit function theorem, Absolute and conditional convergence of series of real terms, Rearrangement of series, Uniform convergence of series.

Metric spaces, Open and closed spheres, Closure, Interior and Exterior of a set. Sequences in metric space, Cauchy sequence convergence of sequences, Examples Complete metric spaces, Continuity in metric spaces, Properties of continuous functions.
SECTION - B

Complex Analysis
Function of a complex variable; Demoiver's theorem and its applications, Analytic functions, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singularities, Cauchy residue theorem and contour integration, Fourier series and Fourier transforms, Analytic continuation.
Suggested Books

	Title	**Author**
1	Advance Calculus	Kaplan, W.
2	Analytical Function Theory Vol. I	Hille, E.
3	An Introduction to Differential Geometry	Wilmore, T.S.
4	Complex Analysis	Goodstein, G.R.G.
5	Calculus with Analytical Geometry	Yusuf, S.M.
6	Differential Geometry of Three Dimensions	Weatherburn, C.E.
7	Elements of Complex Analysis	Pennisi, L.L.
8	Theory of Groups	Majeed, A.
9	Mathematical Methods	Yusuf, S.M.
10	Mathematical Analysis	Apostal, T.M.
11	Principles of Mathematical Analysis	Rudin, W.
12	The Theory of Groups	Macdonald, I.N.
13	Topics in Algebra	Herstein, I.N.