

Mathematics
B.A./B.Sc. I year
Paper-1

Matrices, Trigonometry and Vector Analysis **M.M.: 50**

Note: There shall be three sections A, B and C in this paper. Questions within all the three sections shall carry equal marks. Section A will be compulsory and objective in nature having ten questions. Marks allotted to this section will be 10. Questions in section B will be short answer type of 20 marks. Candidates will have to attempt four out of eight questions selecting at least one question from all the three parts (viz. Matrices, Trigonometry and Vector Analysis). Question in section C will be of descriptive nature of 20 marks. Candidates will have to attempt any two out of four questions. The number of questions for framing of question paper shall be 30% from Matrices, 30% from Trigonometry and 40% from Vector Analysis. The question paper be framed proportionately from the whole syllabus.

Matrices

Symmetric, Skew-Symmetric, Hermitian and skew-Hermitian matrices, Orthogonal and Unitary matrices, Elementary operations on matrices, Inverse of a matrix, Linear dependence of rows and columns of a matrix, Row rank, column rank and their equivalence, Rank of a matrix, Eigen vectors, Eigen values and the characteristics equation of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Applications of matrices in solving system of linear (both homogeneous and non-homogeneous) equations, Conditions of consistency for a system of linear equations.

Trigonometry

Exponential, Logarithmic, Circular and hyperbolic functions together with their inverses, Gregory's series, Summation of Trigonometric series, Trigonometric expansions of sine and cosine as infinite products (without proof).

Vector Analysis

Vector Algebra: Triple products, Reciprocal vectors, products of four vectors.
Vector Differentiation: Ordinary Differentiation of vectors, Applications to mechanics and geometry, Differential operators, ∇ , Definitions of ∇ , Gradient, Divergence, Curl, Vector identities.

Vector integration: Line, Surface and Volume Integrals, Simple applications of Gauss's divergence theorem, Green's theorem and Stoke's theorem (without proof).

Paper-II

Calculus

Note: There shall be three sections A, B and C in this paper. Questions within all the three sections shall carry equal marks. Section A will be compulsory and objective in nature having ten questions. Marks allotted to this section will be 10. Questions in section B will be short answer type of 20 marks. Candidates will have to attempt four out of eight questions selecting at

least one question from two parts (viz. Differential Calculus and Integral Calculus). Question in section C will be of descriptive nature of 20 marks. Candidates will have to attempt any two out of four questions. The number of questions for framing of question paper shall be 60% from Differential Calculus and 40% from Integral Calculus. The question paper be framed proportionately from the whole syllabus.

Differential Calculus

A brief review of limit, Continuity and differentiability, Rolle's theorem, Mean value theorem and their applications, intermediate value theorem, successive differentiation, Taylor's and Maclaurin's series expansions, Indeterminate forms, Tangents and normals of polar curves, Derivatives of arc, Asymptotes, Curvature, Double Points, Curve tracing, Functions of two variables, Partial differentiation and change of independent variables (two variables), jacobians (simple applications - function of a function case), Maxima and Minima of two independent variables.

Integral Calculus

Integral as limit of a sum, Fundamental theorem of integral calculus (statement only), Beta and Gamma Functions, Change of order of integration in double integrals, Dirichlet's theorem and its Liouville's extension, Multiple integrals, Area (quadrature), Rectification (length of curves), Volumes and Surfaces, Differentiation and integration under the integral sign.

Paper-III

Geometry of Two and Three Dimensions M.M. 50

Note: There shall be three sections A, B and C in this paper. Questions within all the three sections shall carry equal marks. Section A will be compulsory and objective in nature having ten questions. Marks allotted to this section will be 10. Questions in section B will be short answer type of 20 marks. Candidates will have to attempt four out of eight questions selecting at least one question from two parts (viz. Geometry of two and three dimensions). Question in section C will be of descriptive nature of 20 marks. Candidates will have to attempt any two out of four questions. The number of questions for framing of question paper shall be 20% from Geometry of two dimensions and 80% from Geometry of three dimensions. The question paper be framed proportionately from the whole syllabus.

Two Dimensions

A brief review of general equation of second degree, Confocal conics and Points of contact, Polar equation of a conic, Equation of a Chord, Tangent, Normal and polar to a conic.

Three Dimensions

System of coordinates in three dimensions, change of origin, Projections, dc's and dr's, Change of axes, Plane, straight Line, intersection of three planes, Volume of a tetrahedron, Sphere, Cylinder, Cone central conicoids with basic fundamental properties, paraboloids, General equation of second degree in three dimensions. Cylindrical, Spherical coordinate systems, their transformations and their relation to Cartesian coordinate systems.