

B.Sc.-I Semester I
1S Mathematics Paper-I
(Algebra and Trigonometry)

Unit-I : De Moivre's theorem, roots of complex number, circular functions, hyperbolic function, inverse hyperbolic function. Relation between circular functions and hyperbolic functions. Separation of real and imaginary parts of the circular and hyperbolic functions of complex variable.

Unit-II : Trigonometric series: Gregory series, Euler's series, Machin's series, Rutherford's series, summation of series, series based upon $\sin x$, $\cos x$, $\sinh x$, $\cosh x$, exponential series, logarithmic series and series based upon Gregory series.

Unit-III: Elements of quaternion: Definition. Equality and addition, multiplication, complex conjugate of a quaternion, norm, inverse, quaternion as a rotation operator, geometric interpretation, a special quaternion product, operator algorithm, quaternion to matrices.

Unit-IV: Theory of equations: Relations between the roots and coefficients, transformation of equations, cubic equations (Cardon method), Descarte's rule of signs, biquadratic equations.

Unit-V : Matrices: Rank of a matrix, row rank, column rank, eigenvalues, eigenvectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its application.

References Books:

- 1) K.B.Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
- 2) H.S.Hall and S.R.Knight, Higher Algebra, H.M.Publications, 1994.
- 3) Chandrika Prasad, Text Book on Algebra & Theory of Equations, Pothishala Private Ltd., Allahabad.
- 4) S.L.Loney, Plane Trigonometry Part-II, MacMillan & Co., London.
- 5) R.S.Verma & K.S.Shukla, Text Book on Trigonometry, Pothishala Pvt.Ltd. Allahabad.
- 6) Ayres Jr Frank : Matrices : Schaum's outline series, McGraw Hill Book Company, Singapore, 1983.
- 7) T M Karade, Maya S.Bendre, Lectures on Algebra and Trigonometry.
- 8) Hohn Franz E : Elementary Matrix Algebra, Amerind Publishing Co., Pvt.Ltd. 1964.
- 9) Spiegel M.R. :Complex Variables, Schaum's outline series, McGraw Hill, 1981.
- 10) Shanti Narayan : A Test Book of Matrices, S.Chand & Co. Delhi.
- 11) Jack B Kuipers: quaternion algebra of Quaternions and rotation sequences, Princeton University Press, Fifth printing, 2002.

B.Sc.-I Semester I
1S Mathematics Paper-II
(Differential and Integral Calculus)

Unit-I : Definition of the limit of a function, basic properties of limits, continuous functions and classification of discontinuities.

Unit-II : Differentiability, successive differentiation, Leibnitz theorem, indeterminate forms and L'Hospital rule.

Unit-III : Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Maclaurin and Taylor series expansions.

Unit-IV : Partial derivatives and differentiation of real valued function of two variables, homogeneous functions, Euler's theorem on homogeneous functions.

Unit-V: Integration of the form $\int \frac{P_n(x)}{\sqrt{Q}} dx$, reduction formulae for $\int \sin^n x dx$, $\int \cos^n x dx$ and Walli's formula, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \operatorname{cosec}^n x dx$
 $\int \sin^n x \cos^m x dx$ Quadrature, rectification,

References Books:

- 1) Ayres F Jr. : Differential equations, Schaum's outline series, McGraw Hill, 1981.
- 2) Ayres F.Jr. : Calculus, Schaum's Outline series, McGraw Hill, 1981.
- 3) Karade T.M., J.N.Salunke, M.S.Bendre : Graduate level Calculus, SonuNilu, 5, Bandu Soni layout, Gayatri Road Parsodi, Nagpur.
- 4) Karade T.M., Maya S. Bendre : Integration and Differential equations, SonuNilu, 5, Bandu Soni layout, Gayatri Road Parsodi, Nagpur.
- 5) Edwards J : Differential Calculus for Beginners, MacMillan and Co.Ltd.,1963.
- 6) Edwards J : Integral Calculus for Beginners, AITBS, Publishers and Distributors, 1994.
- 7) Forsynth A.R.: ATreatise on Differential Equations, (Sixth Edition) MacMillan and Co.1956.
- 8) Greenspan D. : Introduction to Calculus, Harper and Row, 1968.
- 9] Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
- 10] Gorakh Prasad : Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
- 11] Erwin, Kreyszig :Advanced Engineering Mathematics, John Wiley & Sons, 1999.
- 12] N.Piskunov : Differential and Integral Calculus, Peace Publishers, Moscow.

B.Sc.-I Semester-II
2S Mathematics Paper-III

(Differential Equations: Ordinary and Partial)

Unit-I : Degree and order of a ordinary differential equation, linear differential equations and differential equations reducible to the linear form. Exact differential equations. Differential equations of first order and higherdegree, differential equations solvable for p and y, differential equations in Clairaut's form. Orthogonal trajectories.

Unit-II: Second order linear differential equations with constant coefficients, homogeneous linear ordinary differential equations, equations reducible to homogeneous differential equations.

Unit-III: Reduction of order, transformation of the equation by changing the dependent variable and independent variable, normal form, method of variation of parameters. Ordinary simultaneous differential equations.

Unit-IV: Formation of partial differential equations, partial differential equations of the first order, total differential equation (Pfaffian). Lagrange's method, some special types of equations which can be solved easily by methods other than the general method.

Unit-V : Compatible differential equations. Charpit's general method of solution, partial differential equations of second and higher orders. Homogeneous and non-homogeneous equations with constant coefficients.

References :

- 1) Ayres F Jr. : Differential equations, Schaum's outline series, McGraw Hill, 1981.
- 2) Ayres F.Jr. : Calculus, Schaum's Outline series, McGraw Hill, 1981.
- 3) Birkhoff G : Ordinary Differential equations, John Wiley and Sons, and Rota G.C.1978.
- 4) Coddington : An Introduction to Ordinary Differential Equations, E.A.Prentice Hall of India, 1998.
- 5) Karade T.M., Bendre M.S.: Lectures on Calculus and Differential and Equations, Sonu-Nilu, 5, Bandu Soni layout, Gayatri Road Parsodi, Nagpur.
- 6) Murray D.A.: Introductory course in Differential Equations, Orient Longman(India), 1967.
- 7) Erwin, Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 1999.
- 8) Piaggio HTS: Differential Equations, CBS Publishers & Distributors, Delhi, 1985.
- 9) Siminons G.F. : Differential Equations, Tata McGraw Hill, 1972.

- 10) Karade T.M., Maya S. Bendre : Integration and Differential equations, Sonu- Nilu, 5, Bandu Soni layout, Gayatri Road Parsodi, Nagpur.
- 11) T.M.Karade, Lectures on Differential Equations, Sonu Nilu Publication, Nagpur.
- 12) A.R.Forsyth. A Treatise on Differential Equations. Macmillan and Co.Ltd.London.
- 13) Ian N., Sneddon, Elements of Partial Differential Equations. McGrawHill Book Company, 1988.
- 14) Jane Cronin. Differential equations, Marcel Dekkar, 1994.
- 15) Frnak Ayres. Theory and Problems of Differential Equations. McGraw Hill Book Company, 1972.
- 16) Richard Bronson, Theory and Problems of Differential Equations. McGraw Hill Inc, 1973.

B.Sc.-I Semester II

2S Mathematics Paper-IV

(Vector Analysis and Solid Geometry)

Unit-I : Scalar and vector product of three vectors, product of four vectors, vector differentiation and vector integration.

Unit-II : Space curve t , n , b vectors, fundamental planes, curvature, torsion, Frenet-Serret formulae.

Unit-III : Gradient, divergence and Curl, directional derivative, line integral (existence and evaluation), work done, Greens theorem.

Unit-IV : Sphere: Different forms of sphere, section of a sphere by a plane, sphere through a given circle, intersection of sphere and a line, orthogonal sphere and condition of orthogonality.

Unit-V : Cone : The equation of a cone with a guiding curve, cone with vertex and origin, right circular cone. Cylinder: equation of right circular cylinder.

References :

- 1) Murray R. Spiegel, Theory and problems on Advanced Calculus, Schaum Publishing Company, New York.
- 2) Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
- 3) N.Saran and S.N.Nigam , Introduction to vector Analysis Pothishala Pvt.Ltd.Allahabad.

- 4) Erwin Kreyszig Advanced Engineering Mathematics, John Wiley & sons, 1999.
- 5) Shanti Narayan, A Text Book of Vector Calculus, S.Chand & Co. New Delhi.
- 6) S.L.Loney, The elements of Co-ordinate Geometry Macmillan and Company, London.
- 7) Gorakh Prasad and H.C.Gupta, Text Book on Co-ordinate Geometry, Pothishala Pvt.Ltd.Allahabad.
- 8) T.M.Karade, Maya S. Bendre, Lectures on Vector analysis and geometry, Sonu Neelu Publication, Nagpur.
- 9) R.J.T.Bell, Elementary Treatise on Co-ordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994.
- 10) P.K.Jain and Khalil Ahmad, A Text Book of Analytical Geometry of Two Dimensions, Wiley Eastern Ltd., 1994.
- 11) P.K.Jain and Khalil Ahmad, A Text Book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd, 1999.
- 12) N.Saran and R.S.Gupta, Analytical Geometry of three dimensions, Pothishala Pvt.Ltd. Allahabad.