

Mathematics General

B.A./B.Sc.: Elective

Outlines of Tests

Paper	Title of Course	Marks
A	Calculus (Differential and Integral Calculus)	100
B	Mathematical Methods:(Geometry, Infinite Series, Complex Number, Vector, Linear Algebra and Differential Equations).	100
	Total	200

Syllabi and Courses of Reading

PAPER A: CALCULUS (DIFFERENTIAL AND INTEGRAL CALCULUS)

Note : Attempt six questions, selecting two questions from section I, two from section II, one from section III and one from section IV

SECTION I (i) (2/12) (Limit and Differentiation)

Real Number System, Absolute values, Inequalities, Functions, Limits & Continuity, Derivatives of Algebraic & transcendental functions and Higher derivatives. Statements of: (1) Leibniz theorem, (2) Rolle's theorem, (3) Mean value theorem, (4) Taylor and Maclaurin's series. Increasing & decreasing functions and Indeterminate forms.

(ii) (2/12) (Further Differentiation)

Differentials and Related Rates, Extrema, Concavity, Singular points and Asymptotes. Curvature and Radius of Curvature.

SECTION II (i) (2/12) (Integration)

Anti derivative and indefinite integrals. Techniques of evaluating indefinite integrals. Definite integral as Area. Fundamental theorem of integral calculus properties of definite integral Walli's sine and cosine formulas, Numerical integration, Improper integrals.

(ii) (2/12) (Length Areas and Volume)

Polar Coordinates, Graphing curves in polar coordinates. Area between two curves, curve Lengths. Volume and area of surface revolution.

SECTION III (2/12) (Infinite Series)

Sequences, Infinite series and their convergence, Ratio Test. Cauchy's root test. Comparison test, Integral Test. Absolute and Conditional Convergence. Power series Taylor and Maclaurin series. Taylor's formula with remainder.

SECTION IV (2/12) (Calculus of Several Variables)

Definition: Limit and continuity of a function of two variables, Derivates. Increments and differentials. Extrema of functions two variables (Simple cases)

PAPER B: MATHEMATICAL METHODS

Note:- Attempt six questions, selecting two question from section I, two from section II, one from section III and one from section IV.

SECTION I (i) (2/12) (Plane Analytic Geometry)

Translation and rotation of rectangular axes. General equation of the second degree, properties of parabola, ellipse and hyperbola. Tangent and normal, Parametric representations of curves.

(ii) (2/12) (Vectors)

Rectangular coordinates in space. Vectors in space. Dot product, the cross product and triple products. Vector Valued functions, Limits. Derivatives, Scalar and Vector Fields. Gradients Divergence and curl.

SECTION II (i) (2/12) (Analytical Geometry in Three Dimensions)

Distance between two points, Direction angles. Direction ratio's, Direction Cosines. Lines and Planes Skew Lines Cylindrical and Spherical Coordinates Surfaces of Sphere, Cylinder, Cone, Paraboloid, hyperboloid.

(ii) (2/12) (Complex Numbers and Direction of Qiblah)

Complex Numbers, de Moivre's theorem and its application. Circular, Logarithmic and hyperbolic functions. Cosine, sine and four part formula, Latitude and Longitude Determination of direction of Qiblah.

SECTION III (2/12) (Linear Algebra)

Algebra of matrices, Type of matrices. Operation with in matrices, Determinant of square matrix. Cofactors and minors. Laplace expansion of determinant, Properties of determinants. Elementary row and columns operations of matrices, Equivalent and echelon matrices, Adjoint and inverse of a matrix. Rank of Matrix, Solutions of linear algebraic (homogeneous and non homogeneous) system of equations by the use of matrices. Vector Spaces: Linearly independent sets. Basis and Dimention, Subspaces, Spanning Sets.

SECTION IV (2/12) (Differential Equations)

Formation of differential equations. Families of curves. Orthogonal trajectories initial and boundary value problems. Different methods of solving first order ODE's. The Bernoulli, Ricatti and Clairaut equations. Second and higher order liner differential equations with constant coefficient and their methods of solution. Cauchy-Euler Equations.

Recommended Books:

1. C.W. Evan's Advanced Engineering Mathematics (Chapen and all, Third Edition, 1997.
2. C.H. Edwards and D.E. Panney, Calculus and Analytic Geometry (Preitice Hall Inc. 1982, 1986, 1988).
3. E.W. Swokowski. Calculus with Analytical Geometry (PWS Publisher, Boston Masscuchoseted, 1983).
4. H. Anton, Calculus (third edition) (John Wiley and sons, New York)
5. G.B Thomas, Jr. and R.L. Finney Calculus and Analytic Geometry (9th Edition Addison Wesley Publishing Company, 197.
6. I. D. Hoffmann and G. . Bradley, Calculus for Business, Economics and the Social Sciences.
7. I. Kreyszing , Advanced Engineering Mathematics, (J. Wiley)
8. D.G. Zill, A First Course in Differential Equations with applications, (PWS, Publishers.
9. W. E. Boyee and R.E. Di Prima, Differential Equations and Boundary Value Problems, (J. Wiley, 5th edition 1992).
10. I. N. Herstein, Abstract Algebra, (Prentice Hall, 3rd Edition, 1995).
11. B. T. Copson, Metric Spaces, (Cambridge University Press, 1968).
12. J Greever, Theory and Examples of Point Set Toplogy, (Wardsworth Publishing Company Inc. 1967).
13. W. A. Sunderland, Introduction to Metric and Topological Spaces, (Clarendon Press Oxford, 1975).
14. S.M Yusuf and Muhammad Amin, Calculus with Analytic Geometry, (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, Latest Edition).
15. S.M Yusuf and Muhammad Amin, Mathematical Methods, (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, Latest Edition).