Mathematics B Course

B.A/B.Sc.: Elective

Part-I

Outlines of Tests

Paper	Title of Course	Marks
A	Vector Analysis and Mechanics	100

Syllabi and Courses of Reading

PAPER-I: VECTOR ANALYSIS AND MECHANICS

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

SECTION I (2/12) (Vector Analysis)

Review of vector algebra with particular reference to scalar and vector products, Differentiation of Vectors, Differentiation Formulas, Simple Examples, Scalar and Vector point functions, gradient, divergence and curl of point functions, expansion formulas.

SECTION II (i) (2/12)

Composition and resolution of force, Equilibrium of particle, Forces Moments, Couples, Equilibrium of a system. General Plane force System. General Conditions of equilibrium of coplanar forces.

(ii) (2/12)

Principle of virtual work, Friction, Centre of mass and centre of gravity. Calculation of centre of mass for various bodies : a uniform rod, circular disc, rectangular plate, sphere, hemisphere, cylinder, cone.

SECTION III (i) (2/12) Kinematics and Dynamics of a Particle

Fundamental laws of Newtonian mechanics. Velocity, Acceleration and its components in Cartesian, polar and intrinsic coorinates. Relative motion. Conservative forces. Motion in a Straight Line. Uniformly accelerated motion. Projectile motion.

(ii) (2/12) Central Force Motion

Resisted motion. Simple harmonicmotion and harmonic oscillator. Damped and forced vibrations. Motion in a circle and on other curves. Central forces and central orbits.Apsidal distances. Planetary motion and Kepler's laws.

SECTION IV (2/12)

Collisions of particles: Laboratory and centre of mass frames of reference, Blastic and Inelastic Collisions. Impulse and momentum from Newton's Laws. Conservation of momentum for colliding bodies direct collision between a particle and a fixed barrier, oblique collision between two particles.

Recommended Books:-

1. A.E. Coulson, An Introduction to Vectors, Longman, Green and Co. 1967.
2. G.D. Smith, Vector Analysis , (Oxford University Press, 1962)
3. C.D Collinson, Introductory Mechanics,Edward Arnold (Publisher Ltd London, 1988)
4. Vector Analysis S.M Yusuf (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, Latest Edition.
5. J.L Synge and B.A Griffith, Principles of Mechanics, (Mc Graw-Hill 1959)
6. W. Chester Mechanics, (George Allen and Unwin, 1979)
7. P.Dyhe and R. Withworth, Guide to Mechanics, (Macmillan, 1992)
8. Q. K. Ghori (editor). Introduction to Mechanics (West Pakistan Publishing Co. Ltd., Lahore).

Mathematics B Course
B.Sc.: Elective

Part-II
Outlines of Tests

Paper	Title of Course	Marks
A	Mathematical Methods, Group Theory and Metrics Space	100

Syllabi and Courses of Reading

PAPER-II: MATHEMATICAL METHODS, GROUP THEORY & METRIC SPACES

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

SECTION I (i) Complex Number and Spherical Trigonometry (2/12)

Complex numbers and their properties, de Moiver's Theorem and its applications, circular, logarithmic and hyperbolic functions, Separation into real and imaginary parts. Simple cases of summation of trigonometric series, cosine, sine and four-part formules, latitude and longitude, Determination of direction of Qibla.

(ii) Calculus of Several Variables (2/12)

Definition, limit and continuity of functions of two variables. Partial derivatives. Geometrical meaning of partial derivatives of two variables. Homogenous functions and Euler's Theorem. Increments and differential. The Chain rule implicit functions. Directional Derivatives. Tangent planes and normals of surfaces. Extrema of functions of two variables (simple cases-critical points), second derivatives test and its application.

SECTION II (i) Sequences and Series (2/12)

Sequences, Convergence of a sequence, infinite series and their convergence. Comparison test. d Alembert's ratio test, Cauchy's root and integral tests. Absolute and conditional convergence. Power series.

(ii) Improper and Multiple Integrals (2/12)

Improper integrals the gamma function and its properties, Volume and area of surface of revolution. Double and triple integrals with applications.

SECTION III. Group Theory (2/12)

Definition and examples of groups. Order of an element of a group. Subgroups. Cyclic group. Lagrange's Theorem. Cyclic permutations. Even and Odd permutations.

SECTION IV. Metric Spaces (2/12)

Definition and examples of metric spaces. Cauchy, Schwarz and Minkowski Inequalities (for finite Sums). Open and closed balls, Open and closed sets. Neighbourhoods. Limits Points, closure of a set. Interior, exterior and boundary sets, Sequences in metric space and their convergence.

Recommended Books:-

1.   C.H. Edwards and D.E. Penaey, Calculus and Analytic Geometry (Prentice Hall, Inc. 1982, 1986, 1988)
2.   S.M Yusuf Vector Analysis (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, And Latest Edition.
3.   S.M Yusuf and Muhammad Amin Calculus with Analytic Geometry (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, Latest Edition.
4.   S.M Yusuf and Muhammad Amin Mathematical Methods (Ilmi Kitab Khana, Kabir Street Urdu Bazar Lahore, Latest Edition.