57. MATHEMATICS B. COURSE

APPENDIX 'A'

(Outlines of Tests)

		Marks
Paper 'A' :	Vector Analysis and Mechanics.	100
Paper 'B' :	Mathematical Methods, Group Theory and Metric Spaces.	100
	Total :	200

APPENDIX 'B'

(Syllabi and Courses of Reading)

Paper A : Vector Analysis and Mechanics

Note.- Attempt six questions 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 a 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 coordinates. Relative motion. Conservative forces. Motion in a straight line. Uniformly accelerated motion. Projectile motion.

(ii) (2/12) Central Force Motion

Resisted motion. Simple harmonic motion 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

Collisions of particles : Laboratory and centre of mass frames of reference, Elastic and inelastic collisions. Impulse and momentum from Newton's laws. Conservation of momentum for colliding bodies direct collision between a particle and a fixed barreir, oblique collision between two particles.

Recommended Books :

A.E Coulson, An Introduction to Vectors, Longman, Green and Co. 1967).

G.D. Smith, Vector Analysis, (Oxford University Press, 1962).

C.D. Collinson, Introductory Mechanics, Edward Arnold (Publisher Ltd. London, 1988)

J.L. Synge and B.A. Griffith, Principles of Mechanics, (McGraw-Hill 1959).

W. Chester Mechanics, (George Allen and Unwin, 1979).

P. Dyhe and R. Withworth, Guide to Mechanics, (Macmillan, 1992).

Q.K. Ghori (editor), Introduction to Mechanics (West Pakistan Publishing Co. Ltd., Lahore).

PAPER B : MATHEMATICAL METHOD, GROUP THEORY & METRIC SPACES

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

Section I (i) (2/12) Complex Numbers and Spherical Trigonometry

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, Consine, sine and four-part formules, latitude and longitude, determination of direction of Qibla.

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

Definition, Limit and continuity of functions of two variables-Partial derivatives. Geometrical meaning of partial derivatives of two variables. Homogeneous functions and Euler's theorem. Increments and differential. The chain rnle implicit functions. Directional derivatives. Tangent planes and normals of surfaces. Extrema of functions of two variables (simple cases-critical points), second derivative test and its applications.

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

Sequences, convergence of a sequence, infinite series and their convergence. Comparision tests, d_2' Alembert's ratio test, Cauchy's root and integral tests. Absolute and conditional connergence. Power series.

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

Imporoper interegrals The gamme function and itt properties-Volume, and Area of surface of revolution. Double and triple intergrals with applications.

Section III (2/12) (Group Theory)

Definition and exmples of groups. Order of an element of a group. Subgroups. Cyclic group. Lagrange's theorem. Cyclic permutations. Even and odd permutations.

Section IV (2/12) (Metric Spaces)

Definition and examples of metric spaces, Cauchy, Schwara and Minkowaki inequalities (for finite sums). Open and closed balls. Open and closed sets. Neighbourhoods. Limit points, closure of a set, interior, exterior and boundary sets, Sequences in a metric space and their convergence.

Recommended Books :

C.H. Edwards and D.E. Penaey, Calculus and Analytic Geometry (Prentice Hall, Inc. 1982. 1986, 1988).

E.W. Swokowski, Calculus with Analytic Geometry (PWS Publishers, Boston, Massachosetts, 1983).

H. Anton, Calculus, (5th edition) John Weley and Sons, New York) Addison-Wesley Publishing Company 1994).

I. N. Herstein. Abstract Algebra (Prentice-Hall, third edition, 1995).

B. T. Copson Metric Spaces, (Cambridge University Press, 1968).

J. Greever. Theory and Examples of Point Set Topiogy, (Wardsworth Publishing Company Inc. 1967).

W.A. Sunderland. Introduction to Meteic and Toplogical Spaces, (Clarendon Press Oxford, 1975).