

Session (2022-2023)
Subject : Mathematics

B.Sc . Second Year : Annual Mode

Paper-I	Higher and Abstract Algebra	M.M.:50
Paper II	Differential Equations	M.M.:50
Paper-III M.M.:50	Statics and Dynamics	

B.Sc . Third Year : Annual Mode

Paper-I 50	Linear Algebra and Linear Programming	MM
Paper-II M.M.: 50		Analysis
Paper –III 50	Numerical Analysis	MM.

B.Sc. 2 year (Annual mode)

Paper-I Higher and Abstract Algebra

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 shall be 10. Questions in section B shall 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. Higher Algebra, Group Theory and Ring Theory). Questions 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 Higher Algebra, 60% from Group Theory and 10% from Ring Theory. The question paper be framed proportionately from the whole syllabus.

Higher Algebra

(Lectures 10)

Transformation of equations, Descarte's rule of signs, Solution of cubic equations (Cardon's method), Biquadratic equations, Convergence and Divergence of sequence and series.

Group Theory

(Lectures 20)

Relations and binary operations on a set, Definition, Examples and simple properties of groups, Order of a group and order of an element of a group, Abelian and cyclic groups, Groups of permutations, Even and odd permutations, Symmetric group, Alternating groups. Subgroup: Definition and simple properties (Necessary and sufficient conditions on non-empty set for being subgroups) of subgroups, Cosets of a subgroup and its properties, Quotient group of a group, Lagrange's theorem, Corollaries of Lagrange's theorem. Homomorphism, Fundamental theorem of homomorphism, Kernel of homomorphism, Cayley's theorem, Normal subgroups, Isomorphism theorems.

Ring Theory

(Lectures 10)

Definition, Examples and simple results related to rings, Special rings, Integral domain, skew field and fields.

Paper II Differential Equations

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 shall be 10. Questions in section B will be short answer type of 20 marks. Candidates will have to attempt four out of eight questions. Questions in section C will be of descriptive nature of 20 marks. Candidates will have to attempt any two out of four questions. The question paper be framed proportionately from the whole syllabus.

Differential Equations

(Lectures 40)

Differential equations of first order and first degree, Clairaut's form, Singular solutions, Trajectories, Existence and uniqueness of the solution $dy/dx= f(x,y)$, Initial and boundary value properties, simple

applications of differential equations of first order to the problems of general interest, Linear equations with constant coefficients Simultaneous equation with constant coefficient and of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ where P, Q, R are functions of x, y,z, Homogeneous linear equations, Exact differential equations, Linear differential equations of second order with variable coefficients, Total differential equations, Solutions in series, Partial differential equations of first order, Charpit's method, Linear partial differential equations with constant coefficients.

Paper-III

Statics and Dynamics

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 shall be 10. Questions in section B shall be short answer type of 20 marks. Candidates will have to attempt four out of eight questions selecting at least two question from both parts(viz. Statics and Dynamics). Questions 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 40% from Statics and, 60% from Dynamics. The question paper be framed proportionately from the whole syllabus.

Statics

(Lectures 20)

Centre of gravity in two and three dimensions, Strings in two dimensions (Common catenary of uniform strengths only), Virtual works, Forces in three dimensions, Central axis.

Dynamics

(Lectures 20)

Kinematics, Rectilinear motions, Motion in resisting medium, Central orbits (Excluding Kepler's Laws), Constrained motion (Circular and cycloidal motions only), Moments and products of inertia (Simple case, Theorem of parallel axis, Momental ellipsoid, Principal axes).

B.Sc.Third Year

Paper-I Linear Algebra and Linear Programming **MM 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 shall 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 both parts (viz. Linear Algebra and Linear Programming). Questions 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 80% from Linear Algebra, 20% from Linear Programming . The question paper be framed proportionately from the whole syllabus.

Linear Algebra **(Lectures 8)**

Vector spaces: Vector space, sub spaces, Linear combinations, linear spans, Sums and direct sums, Linear dependence, Bases and dimensions, Dimensions and subspaces, Coordinates and change of bases.

Linear Transformations: **(Lectures 12)**

Linear transformations, rank and nullity, Operations with linear transformations, Linear operators, Algebra of linear operators, Invertible linear operators, Matrix of linear transformation, Matrices and linear transformation, Matrix of linear operator, Change of basis, similarity.

Linear Functional: **(Lectures 10)**

Linear functional, Dual space and dual basis, Double dual space, Annihilators, Transpose of linear transformation, Bilinear, Quadratic and Hermitian forms, quadratic form.

Linear programming **(Lectures 10)**

Programming, Graphical Linear method, Simplex method, the dual of a linear programming problem.

Paper-II **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 shall 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 both parts (viz. Real Analysis and Complex Analysis). Questions 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 Real Analysis, 40% from Complex Analysis. The question paper be framed proportionately from the whole syllabus.

Real Analysis (Lectures 20)

Continuity of functions, Properties of continuous functions, Types of discontinuities, Uniform continuity, Differentiability, Taylor's theorem with various forms of remainders, Riemann integral-definition and properties, Condition of integrability, Convergence and uniform convergence of improper integrals.

Point wise convergence, Uniform convergence, Test of uniform convergence, Convergence and uniform convergence of sequences and series of functions.

Complex Analysis (Lectures 20)

Functions of complex variable, Harmonic functions, Cauchy and Riemann equations, Analytic functions, Complex integration, Cauchy's theorem, Cauchy's integral formula, Taylor's series, Laurent's series, Liouville's theorem, Poles and singularities, Residues, Residue theorem and its applications in the evaluation of integrals.

Paper –III Numerical Analysis MM. 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 shall be 10. Questions in section B will be short answer type of 20 marks. Candidates will have to attempt four out of eight questions. Questions in section C will be of descriptive nature of 20 marks. Candidates will have to attempt any two out of four questions. The question paper be framed proportionately from the whole syllabus.

Numerical Analysis (Lectures 40)

Finite difference, Difference operators, Newton's interpolation formula, divided differences, Interpolation with unequal interval of arguments, Lagrange's formula, Sterling and Bessel formula (application only). Numerical differentiation, Numerical integration, Simpson's rule, Trapezoidal rule and their accuracy, Numerical solution of algebraic equations in two unknown quantities, Regula Falsi, Newton Raphson, Graff's root squaring method. Numerical method of matrix inversion, determination of Eigen values and Eigen vectors.