UNIT 1: ALGEBRA

Groups, Quotient groups, Cyclic groups, Isomorphism theorems, Series, Solvable groups, Nilpotent groups, Group action on a set, Sylow theorems, Rings, Integral domains, Fields, Polynomial rings, Principal ideal domain, Unique factorization domains, Euclidean domains, Gaussian integers, Fields extensions, Splitting fields, Normal extensions, Separable extensions, Finite fields, Galois theory.

UNIT 2: REAL ANALYSIS

Metric spaces: Open sets, Closed sets, Compact sets, Sequences and Continuous functions in metric spaces, The Riemann – Stieltjes Integral, Sequences and Series of Functions, Fourier Series, Higher order derivatives and extreme values of functions of two variables.

Basic properties of Laplace transform, Applications of Laplace transforms to solve ordinary differential equations and integral equations of convolution type, The Lebesgue integral.

UNIT 3: DIFFERENTIAL EQUATIONS

Definition of Legendre Polynomial of degree n, Rodrigues formula, Generating function, Recursion formula, Orthogonality of Legendre polynomials, Solution of Bessel equation of order p, Properties of Bessel functions, Recurrence formula, Generating function, Bessel's integral formula, Zeros and Bessel series, Orthogonal properties, Formation of First Order Partial Differential Equations, Solution of Linear First Order Partial Differential Equations(Lagrange's Method), Integral Surfaces passing through a given curve, Surfaces orthogonal to a given system of surfaces, Compatibility, Charpit's Method, Jacobi's Method, Special types of First Order Equations.

UNIT 4: COMPLEX ANALYSIS

Analytic functions, Conformal mappings, Bilinear transformations, Complex integrals, Cauchy's theorem, Cauchy integral formula, Liouvelli's theorem, Fundamental theorem of Algebra, Maximum modulus principle, Taylor series, Laurent series, Residues, Cauchy residue theorem, Evaluation of improper integrals, Argument principle, Rouche's theorem.

UNIT 5: TOPOLOGY

Topological spaces: The definition and examples, Elementary concepts, Open bases and Open – sub bases, Compact spaces, Products of spaces, Compactness for metric spaces, Separation spaces, Hausdorff spaces, Completely regular spaces and normal spaces, Connected spaces, The Components of a space, Totally disconnected spaces.

UNIT 6: FUNCTIONAL ANALYSIS

Banach Spaces: The definition and some examples, Continuous linear transformations, The Hahn-Banach theorem, The natural imbedding of N in N**, The Open Mapping theorem, The Conjugate of an Operator.

Hilbert Spaces: The definition and some examples, Orthogonal Complements, Orthonormal sets, The Conjugate space H*, The Adjoint of an Operator, The Self – Adjoint Operators, Normal and Unitary Operators, Projections.

UNIT 7: DISCRETE MATHEMATICS AND PROBABILITY

Boolean Algebras: Boolean algebras, Boolean functions, Switching Mechanisms, Minimization of Boolean functions, Karnaugh's graph method, Graphs, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's formula, Euler Circuits, Hamiltonian Graphs, Chromatic numbers, The Four – Colour Problem.

Probability: Classical Probability, Axiomatic approach to probability, Law of addition of probabilities, Multiplication law of probability, Independent events, Baye's theorem.

Model Question Paper

Time: 2 Hours

Max. Marks: 100

There shall be 100 questions of Objective type with multiple choice questions.

15 questions to be set from each unit i.e., from unit 1 to unit 6 and 10 questions from unit 7.

No modification is
required. O.K.

20/05/2022.