DEPARTMENT OF MATHEMATICS

UNIVERSITYY OF KASHMIR, SRINAGAR-190006

(NAAC Accredited Grade A+ University)

No.F(PG Ent Syllabus)/KU/2024
Date: February 23, 2024

PG Entrance Syllabus for Mathematics-2024

Unit-I (4 marks)

Limit and Continuity ($\in$ and δ definition), types of discontinuities, properties of continuous functions on closed intervals, differentiability of functions, Successive differentiation, Leibnitz's theorem, partial differentiation, total differentials, Euler's theorem on homogenous functions.

Unit-II (4 marks)

Tangents and normals (polar coordinates only), pedal equations, curvature and radius of curvature, asymptotes, singular points, tracing of curves in cartesian andpolar coordinates.

Unit-III (4 marks)

Rolle's theorem, Mean value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of sin x, cos x, x^m e^x, log(1+ x), (1+ x) and other functions, maxima and minima, indeterminate forms.

Unit-IV (4 marks)

Integration by partial fractions, integration of rational and irrational functions, definite integrals and their properties, reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations.

Unit- V (4 marks)

Differential equations, integrating factors, Bernoulli's equation, exact differential equations, necessary and sufficient conditions for exactness, symbolic operators, homogeneous and non-homogeneous linear differential equations with constant coefficients and those reducible to such equations.

Unit-VI (4 marks)

Miscellaneous forms of differential equations, first order higher degree equations solvable for x, y, z, p, equations from which one variable is explicitly absent, Clairut's form, equations reducible to Clairut's form.

Unit-VII (4 marks)

Legendre polynomials, Bessel function, recurrence relations and differential equations satisfied by each of these functions, Wronskian and its properties.

Unit-VIII (4 marks)

Formation of partial differential equations, order and degree of partial differentialequations, concept of linear and non-linear partial differential equations, linear partial differential equations of first order, Lagrange's method, Geometrical interpretation of the form $Pp + Qq = R$, Charpit's method, classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Unit-IX (4 marks)

Finite and infinite sets, examples of countable and uncountable sets, real line, bounded sets, suprema and infima, completeness property of R, Archimedean property of R, intervals, concept of cluster points and statement of Bolzano-Weierstrass theorem.

Unit-X (4 marks)

Real sequence, bounded sequence, Cauchy convergence criterion of sequences, Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

Unit-XI (4 marks)

Infinite series, Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, alternating series, Leibnitz's test, definition and examples of absolute, conditional and uniform convergence.

Unit-XII (4 marks)

Sequences and series of functions, point wise and uniform convergence, Mn-test, M-test, statements of the results about uniform convergence and continuity,integrability and differentiability of functions, power series and radius of convergence.

Unit-XIII (4 marks)

Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n and group U(n) of units under multiplication modulo n. Cyclic groups from number systems, complex roots of unity, the general linear group GLn (N, r), groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle and (iv) a square, the permutation group Sym (n), groups of quaternions.

Unit-XIV (4 marks)

Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of a group, examples of subgroups including the center of a group. Cosets, index of a subgroup, Lagrange's theorem, order of an element. Normal subgroups and Quotientgroups.

Unit-XV (4 marks)

Definition and examples of rings, examples of commutative and non- commutative rings: rings from number systems, Zn the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions, subrings and ideals, integral domains and fields, examplesof fields: Zp, Q, R and C.