SYLLABUS OF M. Phil/Ph.D. ENTRANCE EXAMINATION

Time : 3 hours   Full Marks: 100

Group A contains 20 multiple choice questions each of marks 2.
Group B contains 18 short answer type questions each of marks 5.
At least *six* questions will be set both in Group A and B from each unit.
Group A is compulsory.
Students are required to answer any *twelve* questions from Group B

UNIT 1

Functions of single variables: Limit and continuity, uniform continuity, differentiability, maxima and minima, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem.
Functions of two variables: Limit and continuity, differentiability, maxima and minima.
Topology of real numbers: Neighbourhood, limit point of a set, open and closed sets, closure of a set, interior, exterior and boundary points, compactness and boundedness, Bolzano Weirstrass theorem and Heine Borel theorem.
Sequence of real numbers and functions: Limit, limit points, convergence, Cauchy general principle of convergence.
Series: Comparison test, D'Alembert's ratio test, Raabe's test, Cauchy root test and Leibnitz test for the convergence of series.
Riemann Integrals and their properties
Complex analysis: analytic function, C-R equations, singularities, complex integration

UNIT 2

Funtions and relations: binary operation, equivalence and partial order relations, equivalence classes and partition of a set.
Groups: properties of groups, subgroups, cyclic groups, abelian and non abelian groups, Cosets, Lagrange's theorem, normal subgroups, quotient groups, permutation groups, homomorphism and isomoephism, Cauchy's theorem and Syllow's theorems.
Ring: Properties, subrings, ideals, integral domain, field, Characteristic, prime ideal, maximal ideal, Euclidean domain, Eisenstein's criterion for irreducibility.
Vector space: subspaces,linear dependence and independence of vectors, basis and dimension, linear transformation, rank and nullity, matrix of linear transformation, Caley-Hamilton theorem, eigen values and eigen vectors of a linear transformation.
Field: finite field, field extension, finite and algebraic extensions.

UNIT 3

Ordinary Differential equation: First order exact differential equations. Integrating factors, rules to find an integrating factor. First order and higher degree equations solvable for x, y, p. Clairaut's form, singular solutions, general solution. General solution of linear homogeneous and non-homogeneous equations of higher order with constant coefficients, The Cauchy-Euler equation. Second order linear differential equations with variable coefficients.

Partial Differential Equations(PDE): first order first degree by Lagrange's method, first order higher degree by Charpits method, four special forms, Monge's method for the type $Rr + Ss + Tt = V$, Classification of PDE, Homogeneous P.D.E with constant coefficients.