DEPARTMENT OF APPLIED MATHEMATICS
GITAM INSTITUTE OF SCIENCE
GITAM UNIVERSITY

Syllabus for M.Phil. /Ph.D. Entrance examination

PART-A

Operations Research : Linear Programming and its applications: Formulation of L.P. problems, slack and surplus variables, convex sets. Simplex method, artificial variables techniques, big M-method, degeneracy,Revised simplex method, Duality in linear programming, the dual simplex method, integer linear programming, Gomory's cutting plane method, branch and bound method. Assignment models, Hungarian method, the traveling salesman problem, transportation models, methods for initial basic feasible solutions, MODI method, degeneracy in transportation problems.

Dynamic programming, concepts dynamic programming Bellman's principle of optimality, simple models .

Probability &Statistics : Random variables and distribution functions: One and two dimensional random variables (discrete and continuous), distribution functions, joint and conditional distribution functions, probability mass functions, probability density functions, transformation of random variables.

Mathematical expectation and generating functions : Mathematical expectation , moments of a distribution function, probability generating functions, moment generating functions, characteristic functions and their properties, Markov and Chebychev moment inequalities.

Probability distribution :Discrete distributions – Binomial, Poisson distributions and their properties and applications, continuous distributions- gamma , Beta , Cauchy , Normal distributions and their properties and applications.

Testing of Hypothesis : Statistical Hypothesis, Null Hypothesis, Type I and Type II Errors, Critical region and acceptance region, The best test for a simple Hypothesis, The Neymen-Pearson Lemma, The likelihood Ratio test, Test for single mean and difference of means.

Sampling distribution : sampling and Large sample tests, exact sampling distributions, t,

F and their applications, Analysis of variance : Meaning and definition, variance within and between classes, one criterion of classification

PART-B

Real Analysis : Finite, countable and uncountable sets, Metric spaces, compact sets, perfect sets, connected sets.Limits of functions, continuous functions, continuous and compactness, continuity and connectedness, discontinuities, monotone functions, infinite limits and limits at infinity .
The Continuity of Derivatives, Derivatives of Higher Order-Taylor's Theorem, Differentiation of Vector-valued Functions. Definition and Existence of the Integral-Properties of the Integral-Integration and Differentiation, Integration of Vector-valued Functions, Uniform convergence, uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation.

Complex Analysis : Analytic functions and harmonic functions, Cauchy-Riemann equations, sufficient conditions. Contour integration, Cauchy-Goursat theorem antiderivatives, Integral representation for analytic functions, theorems of Morera and Liouville and some applications,uniform convergence of series, Taylor and Laurent series representations, singularities, zeros and poles, Applications of Taylor and Laurent series. Residue theorem, calculus of residues, evaluation of improper real integral, indetermined contour integrals, integrals with Branch point.Rouches theorem.

Differential Equations : Ordinary differential equations, existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ordinary differential equations, Boundary value problems: Green's function, Partial Differential equations : Lagrange and Charpits methods , Cauchy problem.

Numerical Analysis : Interpolation,finite differences,iteration, Newton Raphson method. Direct method,Gauss elimination method,eigenvalue problems,Numericaldifferentiation,numerical integration,Numerical solutions of ordinary differential equations,Picard's method,Rungekutta method, Euler's method,Eulers modified method.

Linear Algebra : Vector spaces, subspaces ,quotient spaces ,linear independence and linear dependence,Bases and dimension ,kernel, range, isomorphism, Matrix representation of linear transformation, dual spaces Cayley Hamilton theorem, Canonical forms ,Inner product spaces.

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Model questions for M.Phil./Ph.D Entrance examination in Applied Mathematics

(1) Analytic function is

(a) not differentiable (b) integrable (c) infinitely differentiable (d) infinitely integrable

(2)If f(x) is a polynomial of degree n ,then n+1 th difference is

(a) zero (b) one (c) constant (d) none of these

(3) The complement of a open set is

(a) closed set (b) open set (c) bounded set (d) none of these

(4) Every Cauchy sequence is

(a) bounded (b) unbounded (c) infinite (d) none of these

(5) A hyper plane is

(a)convex set (b) not a convex set (c)disk with a hole (d) none of these