DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY
APPLIED MATHEMATICS

SYLLABUS FOR DOCTORAL ENTRANCE TEST (DET)
(Effective from 1st July 2017)

PART- A

Part-A shall consist of 50 objective type compulsory questions of (01) mark each based on research aptitude. It shall be of generic nature, intended to assess the research aptitude of the candidate. It will primarily be designed to test reasoning ability, data interpretation and quantitative aptitude of the candidate.

PART-B

Part-B shall consist of 50 objective type compulsory questions of (01) mark each based on the syllabus of the subject as follows:

Unit I : Algebra

Algebra: Review of basic concepts of group theory . Rings : Some basic concepts, Algebra over fields, ideals, Minimal, Maximal & prime ideals, PID and UFD, Euclidean domain, Polynomial rings .Vector space: Review of Basic Concepts .Field: Extension field, Algebraic & Transcendental Extension field, roots of Polynomial, finite field .

Unit II : Ordinary and Partial Differential Equation

Theory of Ordinary Differential Equation: Existence & Uniqueness for Ordinary Differential Equation, Wronskian and Linear independence , Initial value problem for n^{th} order differential equation , Linear equations with variable coefficients , Lipschitz condition .Power Series, Method for solution of Legendre equation , Bessel equation , Lagurre equations.

Fundamental concepts of partial differential equation, Elliptic differential Equations, Parabolic Differential equations, Hyperbolic Differential Equations.

Unit III : Numerical Analysis

Interpolation: Introduction, Interpolating polynomial, Missing term techniques, Newton's forward and backward interpolation formula, central difference formula, Lagrange's interpolation formula for unequal distances. Numerical differentiation: derivatives from forward and backward interpolations, Numerical Integration: General quadrature formula, formulae derived from it.

Unit IV : Operations Research

Introduction to Operations research, Mathematical formation of Linear Programming problems, Graphical solution as two phase method ,Linear Programming problems, Simplex method, Big M method, Duality in linear programming, Dual simplex method, degeneracy.

Assignment and Transportation problems, Game theory: Simple and mixed strategy game, two persons zero sum games, Dominance property.

Unit V : Real and Complex Analysis

Measure theory, function of bounded variation, measurable non-measurable sets, Borel sets, measurable functions, lebesgue integral for bounded function over a set of finite measure, lebesgue integral for unbounded function, theorems on convergence in measure, lebsegue class L^P.

Concept of analytic function, C-R equations and harmonic functions, analytic function, the mean value property, Poisson's formula, Schwarz's theorem and the reflection principle. Conformality, linear transformation and Conformal mapping: areas and closed curves analytic function in regions, conformal mappings, the linear groups, cross-ratio symmetry and oriented circles, use of level surface.

Topological Space : Definition, Open Set, Closed Set, Neighbourhood , filter , Countable Space, Separation axioms, Continuous mapping, Homomorphism, Connectedness and Compactness.

Books and References Recommended :

1. Herstein, I.N, Topics in Algebra, Vikas Publications, Delhi-6, 1969.
2. Coddinggtion, Ordinary Differential Equations.
3. K Sankara Rao, Numerical methods for Scientist and Engineers, Prentice Hall of India.
4. Jain N.K., Iyengar, S.R.K. and Jain R.K., Numerical methods for scientific and Engineering Computations, Wile Eastern Ltd., 1984.
5. Taha H. A, Operations Research: An Introduction, Mc Millian Co., New York.
6. Royden H.L., Real Analysis (3rd Edition), Collier Macmillan International, New York, 1987 .
7. Simons G.F.,Topology And Modern Analysis.