

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

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SYLLABUS FOR DOCTORAL ENTRANCE TEST (DET)

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**

Group, Sub group, co-sets, normal Sub group, Semi group, Ring and Fields, Vector spaces, Vector subspaces, Linear dependence and independence, Bases & Dimension, Linear transformations, The Algebra of linear transformation, Rank of a Linear transformation, Characteristic roots, Relation between characteristic roots and characteristic vectors.

**Unit II: Ordinary and Partial Differential Equations**

Ordinary Differential Equations: Differential Equation of First Order and First Degree, first order and higher degree, Linear Higher order Differential Equation with Constant Coefficient, Homogeneous Linear Differential Equations, Simultaneous Differential Equations.

Partial Differential Equation: Linear Partial Differential Equation of First Order, Non-linear Partial Differential Equation of First Order, Homogeneous Linear PDE with Constant Coefficients, Application of Partial Differential Equations.

**Unit III: Numerical Analysis**

Error and Approximations, Solution of Algebraic and Transcendental Equations, Interpolation for equal and unequal intervals, Inverse interpolation. Numerical Integration and Numerical Differentiation, Numerical Solution of Simultaneous linear equations, Solution of ordinary differential equation using Numerical Methods.

**Unit IV: Operations Research**

Introduction to Linear Programming, Solution by Graphical and Simplex Method, Concept of Degeneracy and Duality, Optimal Solution of Transportation Problems, Assignment Problems.

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### Unit V: Real and Complex Analysis

Elementary set theory, finite, countable and uncountable sets, Sequences and series, convergence, limsup, liminf, Bolzano Weierstrass theorem, Heine Borel theorem, Continuity, Differentiability, Mean value theorem, uniform convergence, Riemann integration and Lebesgue integration.

Concept of analytic function, C-R equations and harmonic functions, analytic function, Complex Integration, Cauchy's Integral Theorem, Cauchy's Integral Formula, Zero's & Poles, Complex Sequence, Series and Power, Taylor's and Laurent Series, Residue (Definition), Residue Theorem, Evaluation of Real Integral, Conformal Mapping.

### Unit VI: Topological Spaces

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

### Unit VII: Probability and Statistics

Random variables, Distribution function, Probability density function, measures of central tendency, dispersion and relationship, basic concepts of sampling and hypothesis testing.

### Books and References Recommended:

1. Herstein, I.N. Topics in Algebra, Vikas Publications, Delhi-6, 1969.
2. Coddington, 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.
8. D.N. Elhance, Veena Elhance, Fundamentals of Statistics, 2<sup>nd</sup> Edition, KitabMahal, 1964.

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