PAPER VIII – NUMERICAL METHODS

Unit I: Transcendental and Polynomial equations

Iteration methods based on second degree equation – Muller method, chebyshev method. Multi point iteration methods, Rate of convergence - Secant method, Newton-Raphson method, Cahebyshev method, Methods of multiple roots systems of non-linear equation-Newton-Raphson method, Methods for complex roots polynomial equations – Descarte's rule of signs, Birge-vieta method, Bairstow method and graffe's roots squaring method.

Chapter 2: Sections 2.4, 2.5 (except muller method), 2.6 (methods of multiple rules only)
2.7. (Newton -Raphson method only) 2.8, 2.9

Unit II: System of linear algebraic equations and eigen value problems..

Linear systems of equations-Direct methods-Triangularization method, Cholesky method, Partition method-Error analysis for direct methods, Iteration methods-Convergence analysis of iterative methods, eigen values and eigen vectors- Jacobi methods for symmetric matrices, Givens methods for symmetric matrices, House holder's method, Rutihauser method, Power method.

Chapter 3: Sections 3.2, 3.3, 3.4, 3.5, 3.7, 3.8, 3.9, 3.10, 3.11.

Unit III: Interpolation and approximation

Higher order Interpolation, finite difference operators, interpolating polynomial using finite differences, Hermite interpolation, Piecewise and spline interpolation, Bivariate interpolation, least square approximation, Gram-schmidt orthogonalizing process, Legendre polynomials, Chebyshev polynomials.

Chapter 4: Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.9.

Unit IV: Differentiation and Integration:

Numerical differentiation – Optimum choice of step length-Extrapolation method – Partial differentiation – Numerical integration – Methods based on interpolation, Method based on undermined coefficients – Trapezoidal method, Simpson's method, Gauss Legendre integration method, Gauss Chebyshev integration method, Raau, integration methods, Lobalto integration methods, composite integration methods – Romberg integration methods – Double integration.

Chapter 5: Sections 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11.

Unit V: Ordinary and Partial Differential Equations:

Numerical methods – Single step methods – Multistep method – Predictor – corrector method – Boundary value problems – Introduction, Initial value problem method shooting methods, Finite difference method – Finite element method.
Chapter 6: Sections 6.3, 6.4, 6.6, 6.7.
Chapter 7: Sections 7.1, 7.2, 7.3, 7.4.

Text Book:

M.K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Enginering Computation", New age International publishers, Fourth Edition, 2003.

References:

1. Corte S.D. and de Boor, "Elementary Numerical analysis – An Algorithmic approach", 3rd Edition, McGraw Hill International Book Company, 1980.
2. James B. Scarboraugh, "Numerical Mathematical Analysis", Oxford & IBH Publishing Company, New Delhi.
3. F.B. Hildebrand, "Introduction to Numerical Analysis:, McGraw Hill, New York, 1956.