

MT-443 Numerical Analysis

Error Analysis

Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart.

Use any computational tools to analysis the numerical solutions.

Finite Difference

Functions of operators, difference operators and the derivative operators, identities. Linear homogeneous and non-homogeneous difference equations. Numerical Differentiation, Forward Difference Method, Backward Difference Method, Central Difference Method.

Solution of Non-linear Equation

Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method. Fixed point Iteration, Bisection Method, Non-linear systems of equations, application to consolidation, settlement and seepage analysis.

Solution of Linear Eguation

Numerical methods for finding the solutions of system of linear equations (Gauss- Elimination, Gauss-Jordan Elimination, Triangularization, Cholesky, Jacobi and Gauss – Seidel). Applications to structural analysis and water distribution network problems.

Interpolation & Curve Fitting

Lagrange's, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves).

Numerical Integration & Differentiation

Computation of integrals using simple Trapezoidal rule, $\frac{1}{3}$ th Simpson's rule, $\frac{3}{8}$ th Simpson's rule. Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, Runge Kutta method of order 4).

Recommended Books

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| 1. Advance Engineering Mathematics | Erwin Kreyszig | Seven |
| 2. Numerical Methods for Engineering | Chapra | 1988 |
| 3. Applied Numerical Analysis | Gerald | 1999 |