

AMAE07 NUMERICAL METHODS

UNIT-1 SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

- 1.1 Solution of algebraic and transcendental equations
- 1.2 Fixed point iteration method
- 1.3 Newton Raphson method Solution of linear system of equations
- 1.4 Gauss elimination method- Pivoting- Gauss Jordan method
- 1.5 Iterative methods of Gauss Jacobi and Gauss Seidel
- 1.6 Matrix Inversion by Gauss Jordan method- Eigenvalues of a matrix by Power method.

UNIT-2 INTERPOLATION AND APPROXIMATION

- 1.1 Interpolation with unequal intervals- Lagrange's interpolation
- 1.2 Newton's divided difference interpolation- Cubic Splines
- 1.3 Interpolation with equal intervals
- 1.4 Newton's forward and backward difference formulae.

UNIT-3 NUMERICAL DIFFERENTIATION AND INTEGRATION

- 3.1 Approximation of derivatives using interpolation polynomials
- 3.2 Numerical integration using Trapezoidal,
- 3.3 Simpson's 1/3 rule and Romberg's method
- 3.4 Two point and three point Gaussian quadrature formulae
- 3.5 Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT-4 INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

- 4.1 Single Step methods
- 4.2 Taylor's series method
- 4.3 Euler's method - Modified Euler's method
- 4.4 Fourth order Runge-Kutta method for solving first order equations
- 4.5 Multi step methods- Milne's and Adams- Bashforth predictor corrector methods for solving first order equations.

UNIT-5 BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

- 5.1 Finite difference methods for solving two-point linear boundary value problems
- 5.2 Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain
- 5.3 One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods
- 5.4 One dimensional wave equation by explicit method.

References Books

1. Chapra. S.C. and Canale.R.P. "Numerical Methods for Engineers, Tata McGraw-Hill, New Delhi, 5th Edition, 2007.