



- 2.5 Acceleration of Convergence
- 2.6 Wegstein's Method
- 2.7 Aitken's  $\square^2$  Method
- 2.8 Extrapolated Iterative Method
- 2.9 Method of False-Position (or) Regula-Falsi Method
- 2.10 Secant Method
- 2.11 Newton-Raphson (N-R) Method
- 2.12 Some Variants of Newton-Raphson Method
- 2.13 Newton-Raphson Method for Multiple Roots (or) Generalized Newton Raphson (GN-R) Method
- 2.14 Generalized Extrapolated Newton-Raphson (GEN-R) Method
- 2.15 Two-Step Iterative Methods for Solving Non-linear Equations

### 3. Numerical Solution of System of Non-linear Equations

- 3.1 Introduction
- 3.2 Successive Approximation (or) Iteration Method
- 3.3 Multi-variable Newton's Method
- 3.4 Extrapolated Successive Approximation (ESA) Method
- 3.5 Accelerated Multi-Variable Newton's (AMVN) Method
- 3.6 Fixed Point Accelerated Multi-Variable Newton's (AMVN) Method
- 3.7 Numerical Finding of Complex Roots

### 4. Numerical Solution of Initial Value Problems

- 4.1 Introduction
- 4.2 Taylor Series Method
- 4.3 Picard's Method
- 4.4 Euler's Method
- 4.5 Modified Euler's Method
- 4.6 Runge-Kutta Method of Order Two
- 4.7 Runge-Kutta Method of Order Four
- 4.8 Runge-Kutta Method for Simultaneous Differential Equations
- 4.9 Predictor-Corrector Methods

### 5. Numerical Solution of Partial Differential Equations

- 5.1 Introduction
- 5.2 Finite-Difference Approximations to Partial Derivatives
- 5.3 Condition for the Negativeness of the Eigenvalues of the Jacobian Matrix
- 5.4 An Upper Bound for the Spectral Radius of the Jacobi Matrix
- 5.5 Convergence of the Modified Jacobi Method
- 5.6 Numerical Solution of Laplace Equation
- 5.7 Refinement of Jacobi Method for the Solution of Laplace Equation
- 5.8 Refinement of Gauss-Seidel Method for the Solution of Laplace Equation
- 5.9 Refinement of SOR Method for the Solution of Laplace Equation
- 5.10 Alternating Direction Implicit Iteration
- 5.11 Bounds for the Eigenvalues of  $H, V, D-1H, D-1V$
- 5.12 Parabolic Equations
- 5.13 Crank-Nicolson Method
- 5.14 Hyperbolic Equations

Bibliography

Index

---

#### About the Author

**V.B.K. Vatti** :- Professor of Engineering Mathematics, Andhra University, obtained his doctorate from Indian Institute of Technology, Bombay after pursuing graduation and post-graduation from Andhra University. He has nearly about 35 years of teaching experience apart from research imparting various mathematical and computational skills to the UG and PG students of engineering. He has nearly 75 publications to his credit in various national and international journals and guided Indian and foreign students amounting to a decent number to obtain their PhD and MPhil degrees.

He has also served the university in various capacities such as coordinator of University Grants Commission, Chief of Employment and Guidance Bureau, HoD of Engineering Mathematics and Chairman of Common Board of Studies in Mathematics, Physics, Chemistry and HSS of engineering. He has authored 2 Text Books namely *Numerical Analysis: Iterative Methods and Graduate Engineering Mathematics* and also co-authored a few books on mathematics for the benefit of distance education students of Andhra University.