

## M.A./M.Sc. (Final) Mathematics

### Paper-III : Numerical Analysis

- Unit 1** : Iterative methods : Theory of iteration method. Acceleration of the convergence. Newton-Raphson method for simultaneous equations. Convergence of iteration process in the case of several unknowns.
- Unit 2** : Chebyshev method. Muler's method. Methods for multiple and complex roots.
- Unit 3** : Solution of polynomial equations : Polynomial equation, Real and complex roots. Synthetic division, the Birge-Vieta, Bairstow and Graefe's root squaring method.
- Unit 4** : System of simultaneous equations (Linear)-Direct method. Method of determinant. Gauss-Jordan, LU-Factorization-Doolittle's. Crout's and Cholesky's. Partition method. Method of successive approximate-conjugate gradient and relaxation methods.
- Unit 5** : Eigen-value problems-Basic properties of eigen-values and eigen-vector. Power methods. Method for finding all eigen-values of a matrix. Jacobi.
- Unit 6** : Givens and Rutishauser method. Complex eigen-values.
- Unit 7** : Curve Fitting and Function Approximations : Least square error criterion. Linear regression. Polynomial fitting and other curve fitting.
- Unit 8** : Approximation of functions by Taylor series and Chebyshev polynomials.
- Unit 9** : Numerical solution of Ordinary differential Equations : Taylor series Method, Picard method, Runge-Kutta methods upto fourth order.
- Unit 10** : Multistep method (Predictor-corrector strategies), Stability analysis-Single and Multistep methods.
- Unit 11** : BVP's of ordinary differential equation : Boundary value problems (BVP's), Shooting methods.
- Unit 12** : Finite difference methods, Difference schemes for linear boundary value problems of the type  $y'' = f(x, y)$ ,  $y'' = f(x, y, y')$  and  $y'' = f(x, y)$ .