

SEMESTER - IV

Paper - III : Computational Physics

Max. Marks: 55

Time: 3 Hrs.

Note: Nine questions will be set and students will attempt 5 questions. Question No. 1 will be compulsory consisting of 4 parts based on the conceptual aspects of the whole syllabus. The answers should not be in yes/no. In addition to Question No. 1 there will be four Units in the question-paper each containing two questions belonging to four Units in the syllabus. Students will select one question from each unit.

UNIT - I

Basic computer organisation: Input unit, Output unit, Arithmetic logic unit, Control unit, Central processing unit. Elements of Fortran language and programme organization: Data types, Arithmetic and logical expressions, Numerical input / output statements, Loop instructions, Transfer of control through logical statements.

Arrays and subscripted variables, Use of functions and subroutines, Common statement, Developing and testing of computer programme for various numerical problems viz. solution of linear and quadratic equations.

UNIT - II

Errors: Round off error, Truncation error, Machine error and propagation error.

Solution of algebraic equations: Bisection method, Iteration method, Newton-Raphson method.

Interpolation and extrapolation: Finite differences, Forward differences and backward differences.

UNIT - III

Matrix addition, Subtraction and Multiplication, Trace and normalisation of matrix, Inverse of matrix.

Solutions of simultaneous linear algebraic equation: Gauss elimination method, Gauss-Jordon elimination method. Matrix Eigen values and Eigen vectors.

UNIT - IV

Differentiation: Taylor series method, Numerical differentiation using Newton's forward difference formula, backward difference formula
Integration: Trapezoidal rule, Simpson's 1/3 rule and 3/8 rule, Gaussian quadrature, Legendre - Gauss Quadrature.

References

1. Theory and problems of programming with FORTRAN - S. Lipschutz and A. Poe, Schaums Series Publication.
2. Numerical methods in Fortran - J.M. McCormick and M.G. Salvadori, Prentice Hall Publication
3. Programmes in Fortran - Raja Ramana, PHI
4. FORTRAN Programming and Numerical Methods – R.C. Desai, Tata McGraw Hill.
5. Numerical Methods – C Balachandra Rao and C K Santha.