

U.G. 3rd Semester Examination - 2024

MATHEMATICS

[HONOURS]

Course Code : MATH-H-CC-T-07

Numerical Analysis (Theory)

[CBCS]

Full Marks : 40

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Symbols and notations have their usual meanings.*

1. Answer any **five** questions: $2 \times 5 = 10$
- a) What do you mean by the degree of precision of a quadrature formula?
 - b) When is the Newton's forward interpolation formula used?
 - c) State the advantage of Lagrange's interpolation.
 - d) Round off the number 78.4625 to four significant digits and compute absolute error and relative error.
 - e) State the basic principle of Newton-Raphson method.
 - f) Is it possible to find numerically least eigen value for a matrix A by power method? Discuss.

[Turn over]

g) What do you mean by the diagonally dominant for system of linear equations?

h) Show that $\Delta \log f(x) = \log \left\{ 1 + \frac{\Delta f(x)}{f(x)} \right\}$.

2. Answer any **two** questions: $5 \times 2 = 10$

a) Discuss the method of iteration for numerical solution of an algebraic and transcendental equation.

b) Describe the Gauss-elimination method for numerical solution of a system of linear algebraic equations.

c) By integrating Newton's forward interpolation formula, obtain the basic form of Trapezoidal rule for numerical integration, taking the error term.

d) Establish Newton's backward interpolation formula. When is this formula used?

3. Answer any **two** questions: $10 \times 2 = 20$

a) i) Describe power method for finding numerically largest eigen value of a square matrix. State the condition of convergence. 6

ii) Deduce the iterative formula for Picard's method for solving initial value problem. 4

b) Established Lagrange's polynomial interpolation formula. Using this formula prove that $y_1 = y_3 - 0.3(y_5 - y_{-3}) + 0.2(y_{-3} - y_{-5})$.

$6 + 4 = 10$

c) Describe Newton's divided difference formula for interpolation formula with remainder. Hence deduce Newton's forward difference interpolation formula from this method.

$7 + 3 = 10$

d) Establish Gauss-Jacobi iteration method for numerical solution of a system of n linear equations with n unknowns. Deduce the condition of convergence for this method.

$6 + 4 = 10$