2022

3rd Semester Examination

MATHEMATICS (Honours)

Paper : C 7-T

(Numerical Methods)

[CBCS]

Full Marks : 40 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any ***five*** questions : 2×5=10

   (a) Compute the value of $\cos\frac{\pi}{3}$ by Taylor's series approximation of order 3 about $x = 0$ and obtain the absolute error.

   (b) Define truncation and round-off error in numerical calculations with example.

   (c) What are the advantages and disadvantages for Secant method?

   (d) Compute the value of $\sqrt{2}$ correct up to three significant figure using Newton Raphson method.

(e) If $f(1)=3, f(2)=7, f(3)=13$ then find the value of $f'(1)$.

(f) Find the value of the integral $\int_0^1 \frac{\ln(1+x)}{x}dx$ with step length 0.5 by Simpson's 1/3 rule.

(g) Show that $\Delta\nabla=\Delta-\nabla$.

(h) Let $f(x)=3x^3+13x-114$. What is the value of absolute error for $\int_0^1 f(x)dx$ using Simpson's 1/3 rule.

2. Answer any ***four*** from the following : 5×4=20

(a) Compute $y(1.2)$ from $\frac{dy}{dx}=x^2+y^2$ with $y(1) = 0$ using Runge Kutta method of 4th order.

(b) Determine the largest eigen value of the matrix given as follows using power method :

$$A=\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$$

(c) Derive the Newton-Cote's integration formula for a given function $y=f(x)$ in the interval $[a, b]$ with error term.

(d) Find the real root of $x^3 - x - 1 = 0$ using Regula Falsi Method.

(e) Discuss Gauss Jacobi iteration Scheme for solving the system of linear equations with the sufficient conditions of convergent.

(f) Show that the rate of convergent of Newton Raphson Method for finding the real root of an equation is quadric.

3. Answer any ***one*** from the following : 10×1=10

(a) Solve the following system of equations by LU decomposition method :

$$2x-3y+4z=8;\ x+y+4z=15;\ 3x+4y-z=8$$

(b) Discuss the Newton's Forward interpolation formula and using it find a polynomial which take the following values :

x	0	1	2	3	4	5
y	41	43	47	53	61	71