

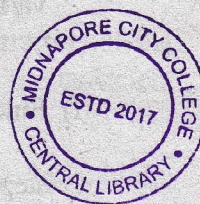
2022

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.

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- (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  $\Delta V = \Delta - V$ .

- (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 :  $5 \times 4 = 20$

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



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- (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 quadratic.

3. Answer any *one* from the following :  $10 \times 1 = 10$

- (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

