B.Sc./3rd Sem (H)/MATH/23(CBCS)
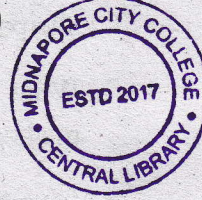
2023

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.

Group - A

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

1. Write the difference between relative and absolute error.

2. What do you mean by degree of precision of a quadrature formula. Write the degree of precision of Simpson's $\frac{1}{3}$ rule and Weddle's rule.

3. Define ill-conditioned and well-conditioned system of linear equations.

4. Write the advantage and disadvantage of linear iteration method.

P.T.O.

5. Find the difference of the approximate numbers 27.5 and 35.8 having absolute errors 0.02 and 0.03 respectively. Evaluate the absolute and the relative errors of the result.

6. Write the advantage and disadvantage of Lagrangian interpolation.

7. What is the main difference between Regula-Falsi method and Secant method.

8. Give the geometrical interpolation of Euler's method.

Group - B

Answer any *four* questions : $5 \times 4 = 20$

9. Derive Simpson's one third rule from Newton's Cotes formula.

10. Solve the following equations

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

by LU decomposition method.

11. If a number is correct upto n significant figures and the first significant digit of the number is k, then prove that the relative error is less than $\dfrac{1}{k \times 10^{n-1}}$.

12. Describe Newton-Raphson method for computing a

simple real root of an equation $f(x) = 0$. Give geometrical interpretation of the method.

13. Use Runge-Kutta method of fourth order, find $y(0.4)$ for the differential equation $\dfrac{dy}{dx} = xy + y^2$, given that $y(0) = 1$, (taking $h = 0.2$).

14. Find the largest eigen value in magnitude and corresponding eigen vector of the matrix

$$A = \begin{pmatrix} 1 & 3 & 2 \\ -1 & 0 & 2 \\ 3 & 4 & 5 \end{pmatrix}.$$

Group - C

Answer any *one* question : $10 \times 1 = 10$

15. Establish Lagrange's interpolation formula. Show that the Lagrangian functions are invariant under a linear transformation. 7+3

16. (a) Describe the method of least squares to fit a straight line $y = \alpha x + b$.

(b) Solve the following system of equations

$$3x + y + 2z = 6$$
$$-x + 4y + 2z = 5$$
$$2x + y + 4z = 7$$

by Gauss-Seidal's method. 5+5