

(FOR THE CANDIDATES ADMITTED

SUB CODE : 25PMS209

DURING THE ACADEMIC YEAR 2025 – 2026 ONLY)

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY 2026

MSc.-MATHEMATICS

MAXIMUM MARKS: 75

SEMESTER: II

TIME : 3 HOURS

NUMERICAL METHODS

SECTION – A

(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(K1)

1. _____ error mean the error in the succeeding steps of the process due to the occurrence of an earlier error

(a) Round off (b) Blunder (c) Propagated (d) Truncation

2. If only the diagonal terms are non-zero the matrix is called a _____ matrix.

(a) Transposition (b) lower triangular (c) diagonal (d) upper triangular

3. We can improve the accuracy of the Trapezoidal rule integral by a technique that is similar to Richardson extrapolation. This technique is known as _____ integration formula.

(a) Simpson's $\frac{1}{3}$ (b) Simpson's $\frac{3}{8}$ (c) Newton's Cotes (d) Romberg

4. _____ uses the slope at a single point to estimate the next value

(a) improved Euler's method

(b) Euler's method

(c) Modified Euler's method

(d) Adams-Moulton method

5. If A is $n \times n$ and non-singular, there are usually exactly n different vectors x which, when multiplied by the matrix A , give a scalar multiple of x , these are called _____

(a) Eigen vectors (b) Eigen values (c) boundary vectors (d) characteristic values

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

6. What is called round off error?

7. Write about diagonally dominant system.

8. Define numerical integration

9. Write Euler predictor –corrector formula

10. What is known as characteristic value problem?

SECTION – B

(5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K3)

11. a) Solve $f(x) = x^3 + x^2 - 3x - 3 = 0$ by using Newton's method for polynomials.

(OR)

b) Solve the equation $x^3 + x^2 - 3x - 3 = 0$ by using Secant method

12. a) Solve the given system of equations by using Gauss-Elimination method.

$2x_2 + x_4 = 0$; $2x_1 + 2x_2 + 3x_3 + 2x_4 = -2$; $4x_1 + 3x_2 + x_4 = -7$; $6x_1 + x_2 - 6x_3 - 5x_4 = 6$

(OR)

b) Solve $A = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 2 & 3 \\ 2 & -2 & -1 \end{bmatrix}$ by using LU Decomposition method

13. a) Use Simpson's $\frac{1}{3}$ rule to evaluate the integral of e^{-x^2} over the interval 0.2 to 0.5 using 2,4,6..... Subdivisions until the values converge to five decimal places.

(OR)

b) Evaluate the integral $I = \int_1^2 \int_1^2 \frac{dx dy}{x+y}$ using the trapezoidal rule with $h=k=0.5$

14. a) Given $\frac{dy}{dx} = \frac{1}{x} + y$, $y(0) = 2$, $y(0.2) = 2.0933$, $y(0.4) = 2.1755$, $y(0.6) = 2.2493$ find $y(0.8)$ using Milne's method

(OR)

b) Solve $y' = x - y^2$, $y(0) = 1$ at the point 0.1 up to four decimal places by using Taylor's series method.

15. a) Find the general solution of the difference equations $\Delta^2 u_n - 3\Delta u_n + 2u_n = 0$ Is the solution bounded?

(OR)

b) Solve a second order equation by the shooting method for

$$X'' = t + \left(1 - \frac{t}{5}\right)X, \quad X(1) = 2, \quad X(3) = -1$$

SECTION – C

(5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) Find a root of $f(x) = \sin x - \frac{x}{2}$ near $x = 2.0$ by using Muller's method

(OR)

b) Solve the equation $f(x) = 3x + \sin x - e^x$ by using Modified linear interpolation and also linear interpolation methods

17. a) Solve the system of equations; $6x_1 - 2x_2 + x_3 = 11$;

$$x_1 + 2x_2 - 5x_3 = -1; -2x_1 + 7x_2 + 2x_3 = 5 \text{ by using Gauss-Jacobi method}$$

(OR)

b) Use Relaxation method to solve the system $8x_1 + x_2 - x_3 = 8$;

$$2x_1 + x_2 + 9x_3 = 12; x_1 - 7x_2 + 2x_3 = -4$$

18. a) Evaluate $\int_0^1 \frac{dx}{1+x}$ using (i) Trapezoidal rule (ii) Simpson's one-third rule (iii) Simpson's three-eighth rule (here $h=0.6$).

(OR)

b) From the following data obtain the first and second derivatives of $y = \log_e x$ at $x=550$.

X	500	510	520	530	540	550
$y = \log_e x$	6.2146	6.2344	6.2538	6.2729	6.2916	6.3099

19. a) Use Runge-Kutta method of the fourth order to find $y(0.1)$, $y(0.2)$ and $y(0.3)$, given $\frac{dy}{dx} = -2x - y$, $y(0) = -1$ with $h = 0.1$

(OR)

b) Given $y' = -y$ and $y(0) = 1$ determine the values of y at $x = (0.01)(0.01)(0.04)$ by Euler's method.

20. a) Determine Eigen values and vectors of the matrix $A = \begin{bmatrix} -10 & -7 & 7 \\ 5 & 5 & -4 \\ -7 & -5 & 6 \end{bmatrix}$ by using Power method

(OR)

- b) Determine the Eigen values and Eigen vectors for the matrix.

$$A = \begin{bmatrix} 10 & 0 & 0 \\ 1 & -3 & -7 \\ 0 & 2 & 6 \end{bmatrix}$$
