A–1043

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MT-603

M.A./M.Sc. Mathematics (MAMT/MSCMT)

Numerical Analysis-I

Examination, 2026 (Feb.)

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Solve the following system of equations by Newton-Raphson method :

$$y - \sin(x + y) = 0$$

$$x - \cos(y - x) = 0$$

Taking initial approximation $x_0 = 1$, $y_0 = 1$.

2. Perform two iterations of Muller's method to find the root of the equation $x^3 - x - 1 = 0$ Take $x_0 = -1$, $x_1 = 0.5$, $x_2 = 1$ as initial approximations.

3. Perform two iterations of Bristow-method to find two roots of the equation $x^4 - 3x^3 + 20x^2 + 44x + 54 = 0$ use (2, 2) as initial approximation.

4. Solve the system of equations by LU factorization method.

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

5. Use Jacobi method compute the eigenvalues of given matrix (perform two iteration only) :

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Find the real root of the equation $x^3 - 9x + 1 = 0$ by using the bisection method upto three iteration.

2. Find the root of the equation $x^4 - x - 10 = 0$ using Chebyshev method.

3. Find a root of the equation $x^3 + x^2 - x - 1 = 0$ with multiplicity 2, taking initial approximation as $x_0 = -0.9$.

4. Find the derivatives of $x^4 - 4x^3 + 8x^2 - 8x + 4$ at $x = 3$ using synthetic division.

5. Using the Gauss Jordan method solve the following linear equations :

$$2x + 8y + 2z = 14$$

$$6x + 6y - z = 13$$

$$2x + y + 2z = 5$$

6. Find the eigenvalues of the matrix :

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

7. Compute the eigenvalues using the Rutishauser method of the following matrix :

$$A = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}$$

8. Find the quotient and remainder on division of polynomial $x^4 - 5x^3 + 6x^2 + 4x - 18$ By a linear factor $(x - 2)$. Also verify the result.

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