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MT-603

Numerical Analysis-I

MA/MSC Mathematics (MAMT/MSCMT)

3rd Semester Examination, 2023 (June)

Time : 2 Hours] **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only. (2×9½=19)

1. Solve the system of equation by LU factorization method.

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$

2. Find all the eigenvalue and eigenvector of the matrix

$$A = \begin{bmatrix} 1 & \sqrt{3} & 4 \\ \sqrt{3} & 4 & \sqrt{3} \\ 4 & \sqrt{3} & 1 \end{bmatrix}$$, using Jacobi method (perform two iteration).

3. Using the Rutishauser method, find all the eigenvalues of the matrix $A = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}$.

4. Find the root of the equation $x^3 - x^2 - x - 1 = 0$ using Chebyshev method.

5. Define the following :

(a) Iteration Method.

(b) Hermitian Matrix.

(c) Unitary Matrix.

(d) Newton-Raphson Method for multiple root.

SECTION–B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only. (4×4=16)

1. Find square root of 10 using Newton-Raphson method.

2. Find the root of the equation $4\sin x + x^2 = 0$ by secant 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. Divide $x^5 - 2x^4 + 2x^2 + 4x - 1 = 0$ by $(x - 3)$ using synthetic division and find quotient polynomial and remainder.

5. Using the method of determinant solve the given system of equations

$2x - 3y + 5z = 11$

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

$x + y - 2z = -3.$

6. Obtain the largest eigenvalue in magnitude and corresponding eigenvector of the matrix.

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

7. Find a real root of $x^3 - x^2 - x - 1 = 0$ near $x = 2$, using Birge-Vieta method.

8. Find double root of the equation $x^3 - 0.75x + 0.25 = 0$, taking initial approximation $x_0 = 0.3$.