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MT-603

Numerical Analysis-I

MA/MSC Mathematics (MAMT/MSCMT)

3rd Semester Examination, 2022 (Dec.)

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. Calculator is allowed in this paper. (2×9½=19)

1. Use Gauss-Jordan method to solve the following linear equations

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$x + y + 5z = 7.$$

2. Find all the eigenvalue and eigenvector of the matrix

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$, using Jacobi method (perform two iteration).

3. Using the Rutishauser method, find all the eigenvalues of the matrix $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$.

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

5. Define the following :

(a) Bisection Method.

(b) Regula Falsi Method.

(c) Secant Method.

(d) Newton-Raphson Method.

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. State and Prove the Newton-Raphson method.

2. Find the root of the equation $\log x - \cos x = 0$ by bisection method upto third approximation.

3. Find square of 13 using Chebyshev method upto third approximation.

4. Find a real root of the equation $x^4 + 7x^3 + 24x^2 - 15 = 0$, using Birge-Vieta method. Perform two iterations.

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

$x + y + z = 3$

$2x - y + z = 2$

$x - 2y + 3z = 2$

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

$$A = \begin{bmatrix} -5 & 2 & 1 \\ 1 & -9 & -1 \\ 2 & -1 & 7 \end{bmatrix}$$

7. Find all the roots of the polynomial equation $x^3 - 3x^2 - 6x + 8 = 0$, using Graeffe's root squaring method.

8. Find real root of the equation $x^3 - 2x - 5 = 0$ using secant method.