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MT–603

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

(Numerical Analysis–I)

3rd Semester Examination, 2024 (June)

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. Using Muller's method, find the root of the equation $f(x) = x^3 - x - 1 = 0$, with the initial approximations :

$$x_{i-2} = 0,\ x_{i-1} = 1,\ x_i = 2.$$

2. Solve the system :

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 8 \\ -4 \\ 16 \end{bmatrix}$$

by Cholesky's method.

3. Determine the largest eigen value and the corresponding eigen vector of the matrix :

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

4. Using Graeffe's method, find the real roots of the equation :

$$x^3 - 6x^2 + 11x - 6 = 0$$

5. Find the dominant eigen value and the corresponding eigen vector correct to two decimal places of the matrix A using the power method.

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

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 a real root of the polynomial equation :

$$f(x) = x^5 - 0.34628x^4 + x^3 + 3.768x + 10 = 0$$

correct to six decimal places using the method of synthetic division.

2. Solve the equations :

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

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

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

by the method of LU decomposition.

3. Use the Newton-Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.

4. Use the method of iteration to find a positive root of the equation $xe^x = 1$, given that the root lies between 0 and 1.

5. Solve the system :

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

by the Gauss-Jordan method.

6. Find a real root of $f(x) = x^3 - 3x^2 + 4x - 5 = 0$, Birge-Vieta method.

7. Find all the eigenvalues of the given matrix using Rutishauser method :

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 2 \\ 1 & 3 & 2 \end{bmatrix}$$

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

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