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MT-603

NUMERICAL ANALYSIS-I

MA/MSC Mathematics (MAMT/MSCMT)

3rd Semester Examination, 2023 (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. 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)

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. Find a real root of the equation $x = e^{-x}$, using the Newton-Raphson method.

2. Solve the system

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 8 \\ -4 \\ 16 \end{bmatrix}$$

by Cholesky's method.

3. Use Jacobi's method to find all the eigen values and eigen vectors of the matrix A.

$$\mathrm{A} = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

4. Use the synthetic division to solve

$$f(x) = x^3 - x^2 - 1.0001x + 0.999 = 0$$

in the neighbourhood of $x = 1$.

5. Find the quadratic factor of the polynomial $f(x) = x^3 - 2x^2 + x - 2$, by Bairstrow's method with two approximations starting with $r_0 = -0.5$ and $s_0 = 1$.

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 the eigen values and the eigen vectors of the matrix :

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

2. Decompose the matrix A using Crout's method.

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

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

4. Find the dominant latent root and the corresponding eigen vectors of the matrix A using Power method.

$$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}, \text{taking } Y_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

5. Solve the system

$$4x + 3y - z = 6$$

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

$$x + y + z = 1$$

using the Gauss-Jordan method.

6. Find the root of the equation $2x = \cos x + 3$ correct to three decimal places by iteration method.

7. Decompose the matrix A into the form LU, where L is a lower triangular matrix and U is an upper triangular matrix.

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

8. Solve $x^3 - 8x^2 + 17x - 10 = 0$ by Graeffe's method, squaring three times.