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MAMT-08

Numerical Analysis

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

2nd Year Examination, 2023 (June)

Time : 2 Hours] **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 answer 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 Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

(2×19=38)

1. Compute $y(1.2)$ by using Runge-Kutta method, where $y(t)$ is the solution of the IVP

$$\frac{dy}{dt} = ty \; ; \; y(1) = 2$$

Also compute the solution with analytical solution.

2. Compute $y(0.5)$ by using Milne's method, given that

$$\frac{dy}{dt} = 2e^t - y$$

$y(0) = 2$, $y(0.1) = 2.01$, $y(0.2) = 2.04$, $y(0.3) = 2.09$, also verify the solution.

3. Find all the eigenvalues and eigenvectors of the following matrix using Given's method

$$A = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 5 & 1 \\ 2 & 1 & 6 \end{bmatrix}$$

4. Find all the root of the equation

$x^4 - 3x + 1 = 0$

Using Graffe's root squaring method.

5. Find the root of the equation

$x^3 - x^2 - x - 1 = 0$

Using Chebyshev method and Newton-Raphson method and also compare the result.

SECTION–B

(Short Answer Type Questions)

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. (4×8=32)

1. Solve the equation $x \log_{10} x = 1.2$ be Regula-falsi method.

2. Perform two iteration of Muler'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 approximation

3. Solve the following linear equations :

$3x + 2y + z = 10$

$2x + 3y + 2z = 14$

$x + 2y + 3z = 14$

Using Gauss-Jordan method.

4. Find the eigenvalues and eigenvector of the following matrix

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

5. Fit a curve of the form $y = ax + bx^2$ to the given data.

x	1	15	2	2.5	3	3.5	4
y	1.1	1.95	3.2	5	8.1	11.9	16.4

6. Express $2 - x^2 + 3x^4$ as a sum of Chebyshev polynomial.

7. Use Picard's method to compute $y(0.5)$, where $y(t)$ is the solution to the given IVP

$$\frac{dy}{dt} = 1 + y \;\; ; \;\; y(0) = 1$$

8. Solve the BVP

$$\frac{d^2y}{dx^2} = x + y \;\; ; \;\; y(0) = 0, y(1) = 0 \text{ with step size } h = \frac{1}{4}$$