S-1056

Total Pages : 4 Roll No. .....

MAMT-08

Numerical Analysis

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

2nd Year Examination, 2022 (Dec.)

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.

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. Find a real root of the equation

$$3x - \sqrt{1+\sin x} = 0$$

Using Iteration method.

2. Using Jacobi's method to find all the eigenvalues and eigenvectors of the following matrix A (perform three iterations)

$$A = \begin{bmatrix} 1 & 1 & 0.5 \\ 1 & 1 & 0.25 \\ 0.5 & 0.25 & 2 \end{bmatrix}$$

3. Compute $y(1.4)$, using fourth order Runge-Kutta method, given that

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

Perform two iteration and also verified the numerical solution with analytical solution.

4. Use Adams-Mouitan predictor corrector formulae to compute $y(0.4)$, given that

$$\frac{dy}{dt} = ty;\ = y(0) = 1,\ y(0.1) = 1.01,\ y(0.2) =$$

$$1.022,\ y(0.3) = 1.023$$

Also verify the solution.

5. Find the root of the equation $x^3 - x - 1 = 0$ by Muller's method (Perform three iteration). Take –1, 0.5 and 1 as initial approximations.

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. Find the root of the equation

$$x^2 - 5x + 2 = 0$$

Perform three iteration and correct to four decimal places by Newton-Raphson method.

2. Find the root of $\sqrt{13}$ by Chebyshev method perform upto third iteration and six decimal places.

3. Find a root of the equation

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

With multiplicity 2, taking initial approximation as $x_0 = -0.9$

4. Use synthetic division and perform two iterations of the Birge-Vieta method to find the smallest positive root of the equation

$2x^3 - 5x + 1 = 0$

take initial approximation as 0.5

5. Solve the system of equations by LU factorization method

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$

6. Fit a straight line to the given data :

x	–1	0	1	2	3	4	5	6
y	10	9	7	5	4	3	0	–1

Also find the value of y at $x = 3.5$.

7. Use Picard's method to compute $y(t)$ given that

$$\frac{dy}{dt} = \frac{e^{-1}}{y};\ y(0) = 2.$$

8. Solve the BVP

$$\frac{d^2y}{dx^2} = xy$$

$y(0) + y'(0) = 1,\ y(1) = 1$

With step size $h = \frac{1}{3}$.