569

Total Pages : 3 Roll No. .....

MAMT-08

Numerical Analysis

MA/M.Sc. Mathematics (MAMT/MSCMT-19)

Second Year Examination, 2021 (Winter)

Time : 2 Hours] **Max. Marks : 80**

Note : This paper is of Eighty (80) 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 Twenty (20) marks each. Learners are required to answer any Two (02) questions only.

(2×20=40)

1. Find all the roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$ using Graeffe's root squaring method.

2. Find double root of the equation $x^3 - 0.75x + 0.25 = 0$ taking initial approximation $x_0 = 0.3$.

3. Use fourth order Runge-Kutta method to compute $y(0.4)$, given that $\frac{dy}{dt} = -2t - y$, $y(0) = -1$ (take step size $h = 0.1$).

4. Use Picard's method to solve $y(0.1)$, given that $\frac{dy}{dt} = 3t + y^2$, $y(0) = 1$.

5. Solve $y(0.4)$ by Milne's method, given that $\frac{dy}{dt} = 2e^t - y$ $y(0) = 2$, $y(0.1) = 2.01$, $y(0.2) = 2.04$, $y(0.3) = 2.09$.

SECTION–B
(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Ten (10) marks each. Learners are required to answer any Four (04) questions only. (4×10=40)

1. Find the real root of equation $x^3 - x - 1 = 0$ using Bisection.

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

3. Solve the following linear equations

$2x_1 + 8x_2 + 2x_3 = 14$

$6x_1 + 6x_2 - x_3 = 0$

$2x_2 + x_2 + 2x_3 = 5$

Using Gauss-Jordan method.

4. Fit a exponential curve of the form $y = ae^{bx}$ to the given data.

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

Also find the value of y *atx* = 4.5.

5. Obtain a second degree polynomial approximation to the function $f(x) = \frac{1}{1+x^2}$, $x \in [1, 1.2]$. Using Taylor series expansion about $x = 1$. Find a bound on the truncation error.

6. Find all the eigen values of the matrix $\begin{bmatrix} 4 & 1 & 1 \\ 2 & 4 & 1 \\ 0 & 1 & 4 \end{bmatrix}$.

7. Express $2T_0(x) + T_1(x) + 2T_2(x)$ as a polynomial in x.

8. Solve the BVP by Numerov method, $\frac{d^2y}{dx^2} = x + y$

$y(0) = 0$, $y(1) = 0$. With step size $h = \frac{1}{4}$.