7. Compute $y(0.5)$ using Milne's method, given that :

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

and the corresponding values of t and y are given as :

t	0.0	0.1	0.2	0.3
y	2	2.01	2.04	2.09

8. Solve the boundary value problem :

$$\frac{d^2y}{dx^2} = y,\ y(0) = 0,\ y(1) = 1.1752$$

by shooting method together with Runge-Kutta method.

9. Solve the boundary value problem :

$$\frac{d^2y}{dx^2} + \left(1 + x^2\right)y + 1 = 0,\ x \in [0, 1]$$

by a second order finite difference method with step size $h = \frac{1}{4}$.

MAMT-08/MSCMT–08

December – Examination 2021

M.A./M.Sc. (Final) Examination

MATHEMATICS

(Numerical Analysis)

Paper : MAMT-08/MSCMT-08

Time : 1½ Hours] [*Maximum Marks :* ***80***

Note :– The question paper is divided into two Sections A and B. Write answers as per the given instructions. Use of non-programmable Scientific Calculator is allowed in this paper.

Section–A 4×4=16

(Very Short Answer Type Questions)

Note :– Answer any *four* questions. As per the nature of the question delimit your answer in one word, one sentence or maximum up to **30** words. Each question carries 4 marks.

1. (i) Show that the real root of equation $x^3 - 2x - 5 = 0$ is lying between (2, 3).

   (ii) Find first derivative of $x^4 - 4x^3 + 8x^2 - 8x + 4$ at $x = 3$, using synthetic division.

   (iii) State principle of least square.

   (iv) Define Chebyshev polynomial of first kind.

   (v) Define Lanczos Economization.

   (vi) Write Picard's formula for solution of differential equation.

   (vii) Write Adams-Moulten predicator and corrector formula.

   (viii) Define Eigenvalue problem.

Section–B **4×16=64**

(Short Answer Type Questions)

Note :– Answer any *four* questions. Each answer should not exceed **200** words. Each question carries 16 marks.

2. Apply Aitken's Δ^2-method to find a root of the equation $\sin^2 x = x^2 - 1$.

3. Perform two iterations of Muller's method to find the root of the equation $x^3 - x - 1 = 0$ by taking $x_0 = -1$, $x_1 = 0.5$ and $x_2 = 1$ as initial approximation.

4. Solve the given system of equation using conjugate gradient method :

$$4x + y = 1$$

$$x + 3y = 2$$

5. Using the Rutishauser method, find all the Eigen-values of the matrix :

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

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

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