Section–C **2×16=32**

(Long Answer Type Questions)

Note :– Answer any *two* questions. You have to delimit your each answer maximum up to **500** words. Each question carries 16 marks.

10. Find all the roots of the equation $x^4 - 3x + 1 = 0$ using Graeffe's root squaring method. Use four squaring to estimate roots.

11. Solve the system of equations by LU factorization method :

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$
$$3x + y + 2z = 8$$

12. Using the Given's method reduce the following matrix to tridiagonal form and use sturm sequence to find eigen values :

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -1 \\ 2 & -1 & 1 \end{bmatrix}$$

13. Solve the following initial value problem :

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0 \quad t \in [0, 0.1]$$
$$y(0) = 0, \qquad y'(0) = 1$$

MAMT-08/MSCMT–08

December – Examination 2023

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

MATHEMATICS

(Numerical Analysis)

Paper : III

Paper : MAMT-08/MSCMT-08

*Time : **3** Hours*] [*Maximum Marks : **80***

Note :– The question paper is divided into three Sections A, B and C. Write answers as per the given instructions. Use of non-programmable scientific calculator is allowed in this paper.

Section–A **8×2=16**

(Very Short Answer Type Questions)

Note :– Answer all questions. As per the nature of the question delimit your answer in maximum up to **30** words. Each question carries 2 marks.

1. (i) Write the order of convergence of Newton-Raphson extended formula.

(ii) Write Newton-Raphson formula to find the multiple root of the equation $f(x) = 0$ with multiplictiy m.

(iii) Define spectrum and spectral radius of a matrix.

(iv) If 2, –3, 3 are eigen values of matrix A then write eigen values of matrix A^4.

(v) Define Unitary matrix.

(vi) State principle of least square.

(vii) Define orthogonal polynomial.

(viii) Write Adams-Moultan predictor-corrector formulae.

Section–B **4×8=32**

(Short Answer Type Questions)

Note :– Answer any *four* questions. Each answer should not exceed **200** words. Each question carries 8 marks.

2. Find a real solution of the given equations using initial approximation as (0.5, 0.5) :

$$x^2 - 5x + 4 = 0$$

$$3xy^2 - 10y + 7 = 0$$

3. Find double root of the equation $x^3 - 0.75x + 0.25 = 0$ by using Newton-Raphson method taking initial approximation as $x_0 = 0.3$.

4. Compute largest eigen value in magnitude and corresponding eigen vector of the matrix :

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

5. Fit a second degree parabola from given data :

x	–4	–3	–2	–1	0	1	2	3	4
y	–5	–1	0	1	3	4	4	3	2

6. Determine the best minimax approximation to the function $f(x) = x^2$ on [0, 1] with a straight line.

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

$$\frac{dy}{dt} = t + y, \qquad t \in [0, 0.4]$$

$t_0 = 0$, $y_0 = 1$.

8. Explain shooting method to find the solution of the boundary value problem.

9. Solve the boundary value problem :

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

by a second order finite difference method with step size $h = ¼$.