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 complex root of the equation $z^2 + 1 = 0$ by Newton-Raphson method using $z_0 = \frac{1}{2}(1+i)$ as initial approximation.

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

12. Compute $y(1.4)$, using fourth order Runge-Kutta method with step size $h = 0.2$, given $\frac{dy}{dt} = \frac{t}{y}$, $y(1) = 2$.

13. Solve the boundary value problem by shooting method together with Runge-Kutta method $\frac{d^2y}{dt^2} = y$, $y(0) = 0$, $y(1) = 1$.

MAMT-08/MSCMT–08

December – Examination 2022

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

MATHEMATICS

(Numerical Analysis)

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 one word, one sentence or maximum up to **30** words. Each question carries 2 marks.

1. (i) Write the condition for Newton-Raphson method to be convergent.

   (ii) Write Newton-Raphson extended formula.

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

(iv) Define Unitary Matrix.

(v) State principle of least square for fitting a curve.

(vi) Write orthogonal property for Chebyshev polynomial.

(vii) What do you mean by stability of a method ?

(viii) Write formula for Runge-Kutta method of order two.

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. Show that Regula-Falsi method has linear convergence.

3. Solve the following system of the equation using partition method :

$$3x + 2y + z = 11.6$$

$$2x + 3y + 2z = 15.9$$

$$x + 2y + 2z = 12.2$$

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

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

5. Fit a parabola to the given data :

x	1970	1980	1990	2000	2010
y	1450	1600	1850	2150	2500

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

7. Use Adams-Moultan predictor corrector formula to compute $y(0.4)$, given that $\frac{dy}{dt} = ty$ and

t	0	0.1	0.2	0.3
y	1	1.01	1.022	1.023

8. Using the Rutishauser method, find all the eigen-values of the matrix $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$.

9. Solve the boundary value problem $\frac{d^4y}{dx^4} = 2$. Given $y(0) = y'(0) = y(1) = y'(1) = 0$.