MAMT-08/MSCMT-08

December - Examination 2025
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** the 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 difference between Regula-Falsi method and Secant Method.

   (ii) Define spectrum of a matrix.

   (iii) Write normal equation for fitting of a parabola $y = a + bx^2$.

   (iv) Express $4x^3 + 2x + 1$ as sum of Chebyshev polynomials.

   (v) Write Milne's predictor corrector formula for solving first order differential equations.

   (vi) State Chebyshev's formula for finding root of an equation.

   (vii) Define Hermitian and Skew-Hermitian matrix.

   (viii) Obtain a second degree polynomial approximation of function $\frac{1}{1+x^2}$ using Taylor series expansion about $x = 1$.

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 square root of 18 using Newton-Raphson method corrected upto 4 decimal place.

3. Find the root of equation $x^4 - x - 10 = 0$ using 3 iteration of Chebyshev method.

4. Explain Power method to find largest Eigen value of a matrix.

5. Using Cholesky (square root) method solve the system of equation -

$4x - y = 1$

$-x + 4y - z = 0$

$-y + 4z = 0$

6. Fit a straight line to the given data, also find value of y at x = 3.5.

X:	–1	0	1	2	3	4	5	6
Y:	10	9	7	5	4	3	0	–1

7. 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.

8. Use Picard's method (2 iterations) to compute $y(t)$ given that $\frac{dy}{dt} = \frac{e^{-t}}{y}$ and $y(0) = 2$.

9. Solve by Milne's method to compute $y(1.4)$ given $\frac{dy}{dt} = \frac{t}{y}$.

t:	1	1.1	1.2	1.3
y:	2	2.052	2.107	2.166

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. Describe Graeffe's root squaring method to find roots of an equation.

11. Explain method of decomposition to solve system of equation and use it to solve :

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$

12. (i) Solve the boundary value problem $\frac{d^2y}{dt^2} = y,\ y(0) = 0,\ y(1) = 1.1752$ by shooting method together with Runge-Kutta method.

(ii) Solve the boundary value problem $\frac{d^2y}{dx^2} = x + y,\ y(0) = 0,\ y(1) = 0$ by Numerov method with step size $h = \frac{1}{4}$.

13. (i) Explain stability analysis of Euler's Method and Runge-Kutta method of order two.

(ii) Explain least square principle for continuous functions.
