MAMT-08/MSCMT-08

June - Examination 2026

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 in each section. 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 convergence rate of secant method.
   (ii) Write normal equations for fitting of a parabola $y = a + bx + cx^2$.
   (iii) Write the formula of Chebyshev method of third order.
   (iv) Define spectrum radius.
   (v) Write corrector formula of Miline's Method.
   (vi) State principle of least square.
   (vii) Write advantage of Graeffe's root squaring method to other synthetic division methods.
   (viii) Define Lanczos Economization.

Section-B **4×8=32**

(Short Answer Type Questions)

Note :- Answer **any four** questions. You have to delimit your each answer maximum up to **200** words. Each question carries **8** marks.

2. Find square root of 27 using Newton-Raphson method corrected upto 4 decimal place.
3. Find the root of equation $x^3 - 2x - 5 = 0$ using regula-falsi method.
4. Explain Jacobi method to find Eigen values of matrix.
5. 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

6. Find a uniform polynomial approximation of degree four or less to the function $f(x) = e^x$ on the interval $[-1, 1]$ using Lanczos economization with error tolerance 0.02.

7. Compute y(1.4), using fourth order Runge-Kutta method, given that $\frac{dy}{dt} = \frac{t}{y}, y(1) = 2$

8. Compute x(0.1), y(0.1) by Taylor's series method where x(t) and y(t) satisfy the system of initial value problems $\frac{dx}{dt} = xy + 2t$, $\frac{dy}{dt} = 2ty + x$ and x(0) = 1, y(0) = 2.

9. Solve the boundary value problem

$\frac{d^2y}{dt^2} = y$ and y(0) = 0, y(1) = 1.2

by employing shooting method, take y'(0) = 0.85, 0.95 as initial guesses.

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. Use $z_0 = \frac{1}{2}(1 + i)$ as an initial approximation.

11. Solve the system of equations Using -

(i) Doolittle's method

(ii) Crout's method

$x + 2y + 3z = 14$

$2x + 5y + 2z = 18$

$3x + y + 5z = 20$

12. Using the Given's method reduce the following matrix to tridiagonal form and use Sturm sequence to find eigenvalues

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

13. (i) Solve the boundary value problem $\frac{d^2y}{dx^2} = xy$ given y(0) + y'(0) = 1, y(1) = 1 with step size $h = \frac{1}{3}$.

(ii) Use Adams-Moultan Predictor corrector formula to compute y(1. 4), given that

$\frac{dy}{dt} = ty$

y(0) = 1, y(0.1) = 1.01, y(0.2) = 1.022, y(0.3) = 1.023
