MA/MSCMT-08

June - Examination 2017

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

Numerical Analysis

Paper - MA/MSCMT-08

Time : 3 Hours] **[Max. Marks :- 80**

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

Section - A **$8 \times 2 = 16$**

(Very Short Answer Type Questions)

Note: Section 'A' contain 08 Very Short Answer Type Questions. Examinees have to attempt all questions. Each question is of 02 marks and maximum word limit may be thirty words.

1) (i) Write the difference between regula-falsi method and secant method.

(ii) Write Newton-Raphson extended formula.

(iii) Write principle of least square.

(iv) Write Normal equation for fitting the curve $y = ax + bx^2$

(v) Write Eigen values of Matrix.

$$A = \begin{bmatrix} 0 & 2 & 3 \\ 0 & -1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$$

(vi) Write x^2 as a sum of Cheby Shev polynomials.

(vii) Write Milines's predicator formula

(viii)Define stability of a method.

Section - B **4 × 8 = 32**

(Short Answer Type Questions)

Note: Section 'B' contain 08 Short Answer Type Questions. Examinees will have to answer any four (04) questions. Each question is of 08 marks. Examinees have to delimit each answer in maximum 200 words.

2) Using Newton - Raphson method perform 4 iterations to find root of equation $x^3 + 1 - \sin x = 0$

3) Perform 2 iterations of synthetic division and Cheby Shev method to find the root of equation $x^3 + x^2 + 3x + 4 = 0$

4) Perform 2 iterations of Jacobi method to estimate the eigen values of given martix

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

5) Fit a curve of the form $y = ax^b$ to the given data.

x :	1	2	3	4	5
y :	87.46	144	172.80	207.40	248.80

6) Obtain a second degree polynomial approximation to the function $f(x) = \dfrac{1}{1 + x^2}$ for $x \in [1, 1.2]$ using Taylor Series expansion about $x = 1$.

7) Compute $y(1.5)$ given $\frac{dy}{dx} = \frac{1}{x+y}$ with $y(0) = 1$ $h = 0.5$ using Euler's Modified method (Range-Kutta Method of order two)

8) Use Miline's Predicator Corrector method compute $y(0.4)$ given $\frac{dy}{dx} = (-y + 2e^{x})$ and $y(0) = 2, y(0.1) = 2.01,$ $y(0.2) = 2.04, y(0.3) = 2.09$

9) Describe shooting method to solve a Boundary value problem.

Section - C $2 \times 16 = 32$

(Long Answer Type Questions)

Note: Section 'C' contain Four Long Answer Type Questions. Examinees will have to answer any two (02) questions. Each question is of 16 marks. Examinees have to delimit each answer in maximum 500 words.

10) Find all roots of equation $z^2 + 1 = 0$. By Newton-Raphson method using $z_0 = \frac{(1+i)}{2}$ as an initial approximation.

11) Use Cholesky method to solve the system of equations

$-x + 4y - z = 0$

$4x - y = 1$

$-y + yz = 0$

12) Compute all eigen values of matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 1 \end{bmatrix}$$ using Rutishauser Method.

13) Explain finite difference method of second and fourth order and use second order finite difference method with step size $h=0.25$ to solve boundary value problem.

$$\frac{d^2y}{dt^2} + (1+t^2)y + 1 = 0, t \in [0,1]$$
