

**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. Using the partition method solve the following system of equation :

$$\begin{bmatrix} 2 & 1 & 1 & 2 \\ 4 & 0 & 2 & 1 \\ 3 & 2 & 2 & 0 \\ 1 & 3 & 2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ -1 \\ -4 \end{bmatrix}$$

12. Solve by Milne's method, find  $y(1.4)$ , given :

$$\frac{dy}{dx} = \frac{x}{y} \quad y(1) = 2, \quad x \in [1, 1.4]$$

13. Solve the Boundary Value Problem

$$\frac{d^2 y}{dx^2} = y, \quad y(0) = 0, \quad y(1) = 1.1752$$

by Shooting method together with Runge-Kutta method.

**403****MA/MSMCT-08****June – Examination 2020****M.A./M.Sc. (Final) Examination****MATHEMATICS****Numerical Analysis****Paper : MA/MSMCT-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.

**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) Distinguish between algebraic and transcendental equation.
- (ii) Show that  $x = 1$  is a multiple root of the equation :

$$x^3 - 3x^2 + 3x - 1 = 0$$

with multiplicity three.

- (iii) Define Hermitian matrix with an example.
- (iv) Write the orthogonal properties of Chebyshev polynomials.
- (v) Define analytical solution of a differential equation.
- (vi) Write Milne's predictor and corrector formula.
- (vii) Explain the concept of stability of a method.
- (viii) Define homogeneous boundary value problem.

**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 equations :

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

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

taking initial approximation as (0.5, 0.5)

- 3. Find the root of the equation  $x^4 - x - 10 = 0$  using Chebyshev method.
- 4. Find the multiplicity of the root  $x = 2$  of the equation

$$x^4 - 5x^3 + 6x^2 + 4x - 8 = 0$$

using synthetic division.

5. Fit a parabola of the second order to the following data :

Year	2011	2012	2013	2014	2015
Price	25	28	33	39	46

- 6. Express  $2 - x^2 + 3x^4$  as a sum of Chebyshev polynomials.
- 7. Find the eigenvalues and corresponding eigen vectors of the matrix A, where :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$$

8. Use Picard's method to approximate the value of  $y$ , where  $y$  satisfies the differential equation :

$$\frac{dy}{dx} = xy + 1$$

Subject to the condition  $y(2) = 0$ .

9. Solve the boundary value problem

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

by a second order finite difference method with

step size  $h = \frac{1}{4}$ .