

7. Using finite difference method to compute $y(0.5)$ where y satisfies the following boundary value problem :

$$\frac{d^2 y}{dx^2} = y$$

$$y(0) = 0, y(1) = 1.8$$

with $h = 0.25$

8. Compute $y(0.2)$ by Taylor's series where $y(t)$ is the solution of the following initial value problem :

$$\frac{dy}{dt} = t + y \quad y(0) = 1$$

9. Use Adams-Moulton predictor corrector formula to compute $y(0.4)$. Given that :

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

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

MA/MSCMT-08

December – Examination 2020

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

MATHEMATICS

Numerical Analysis

Paper : MA/MSCMT-08

Time : 2 Hours]

[Maximum Marks : 80

Note :- The question paper is divided into two Sections A and B. 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 upto 30 words. Each question carries 2 marks.

1. (i) Write the geometrical interpretation of Newton-Raphson method.

(ii) Define Direct method to solve the system of linear equations.

(iii) Express :

$$2T_0(x) + T_1(x) + 2T_2(x)$$

as a polynomial in x .

(iv) Define Least Squares principle.

(v) Write minimax property of Chebyshev polynomials.

(vi) Distinguish between initial value problem and boundary value problem.

(vii) Write any *two* properties of the eigen value.

(viii) Distinguish between single step method and multistep method.

Section-B

4×16=64

(Short Answer Type Questions)

Note :- Answer any *four* questions. Answer should not exceed **200** words. Each question carries 16 marks.

2. Find square root of 13 by using Chebyshev method.

3. Find the root of the following equation :

$$x^3 - 2x - 5 = 0$$

by using Birga-Vieta method correct upto four places of decimal.

4. Fit a straight line to the following data :

x	1	2	3	4	5	6
y	2.6	5.4	8.7	12.1	16	20.2

5. Find the eigen values and eigen vectors of the following matrix :

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

6. Find the root of the equation :

$$x^4 - x - 10 = 0$$

near to $x = 2$ by using Newton-Raphson method correct to three decimals.