$$x + 9y - z = 10$$
$$2x - y + z = 20$$
$$10x - 2y + z = 12$$

4

M.A./ M.Sc. Final Examination, June 2015
MATHEMATICS
Paper: MT-08
(Numerical Analysis)

Time Allowed: 3 Hours

Maximum Marks: 80

Note:- The Question paper is divided into three sections A, B, and C. Use of calculator is allowed in this paper.

Section- A

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 is thirty words.

1. (i). Write the formula of chebysehv method of third order.
   (ii). Write the definition of Eigen values and Eigen vectors.
   (iii). If $\lambda_1, \lambda_2, \lambda_3, \lambda_4 \dots . \lambda_n$ are the eigen values of square matrix A then What are the eigenvalues of A^k.
   (iv). Write the Taylor series expansion of a function.
   (v). Define Hermitian matrix and unitary matrix.
   (vi). Write the formula for finding root of the equation by Muller's method what is rate of convergence of this method?
   (vii). What is minimax principal and minimax polynomial?

(viii). Write the formula for Newton-Raphson method for p^{th} root of a number.

Section- B

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. Solve the following linear equation

$2x_1 + 8x_2 + 2x_3 = 14$

$6x_1 + 6x_2 - x_3 = 13$

$2x_1 + x_2 - 2x_3 = 5$

3. Solve the initial value problem by Taylor's series method

$$\frac{dy}{dt} = -[y + 2t] \ , \ t \in \{0, 0.2\}; \ \ y(0) = -1$$

4. Fit a curve $y = ax^b$ to the following data:

x	1	2	3	4
y	5	7	9	10

Also estimate the value of y at $x = 2.5$.

5. Explain the Milne's predictor corrector formula.
6. Explain Aitken's Δ^2-method to accelerate the convergence.
7. Use Jacobi method to compute eigenvalues of given matrix (two iterations only)

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

8. Find the best lower order approximation to the polynomial $2x^2 + 5x^2$.

9. Explain Newton-Raphson method for complex roots.

2

Section- C

Section 'C' contain 04 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. (i). Using synthetic division find a root of the equation $x^3 + x^2 + x + 4 = 0$ Perform two iterations.

(ii) Extract quadratic factor from the equation $x^3 - 2x + x - 2 = 0$ using Bairstraw method and hence find the roots of the equation, perform only two iterations and use (-0.5, 1) as initial approximation.

11. (i) Using the Rutishauser method to compute all the eigen values of the matrix.

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

(ii). Solve the BVP

$$\frac{d^2y}{dx^2} = \frac{3}{2}y^2, \ y(0) = 4, \ y(1) = 1$$

12. Solve the following initial value problem

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0, \qquad t \in [0, 0.1], \ y(0) = 0,$$

$$y'(0) = 1$$

13. (i) Find all roots of the equation :

$x^3 - 2x^2 - 5x + 6 = 0$ by Graeffe's root squaring method.

(ii) Solve the following system of equation by the Relaxation method.