MA/MSCMT-08

December - Examination 2016

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.

Section - A **8 × 2 = 16**

(Very Short Answer Questions)

Note: Section 'A' contain seven (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 iteration scheme of Chebyshev method.

(ii) Write iteration scheme of relaxation method.

(iii) Write eigen value of matrix $\begin{bmatrix} 1 & 1-i \\ 1+i & 1 \end{bmatrix}$

(iv) Write normal equation for fitting the curve

$y = a_0 + a_1 x + a_2 x^2$.

(v) Write Picard's method of successive approximation.

(vi) Write Milne's predictor formula.

(vii) Write Doolittle's factorization.

(viii)Write synthetic division for n th degree polynomial.

Section - B **$4 \times 8 = 32$**

(Short Answer 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) Find the root of the equation $\sin x = x^3 + 1$ using Newton - Raphson method.

3) Solve the following system of equations using method of determinants:

$$x + 2y + 6z = 9$$
$$2x + 5y + 15z = 22$$
$$6x + 15y + 40z = 61$$

4) Find a real solution of the equations using general iteration method:

$$x - \cos(y - x) = 0$$
$$y - \sin(x + y) = 0 \quad \text{with } (x_0, y_0) = (1, 1).$$

5) Find the inverse of the matrix $\begin{bmatrix} 6 & 3 & 7 \\ 1 & 5 & 2 \\ 7 & 2 & 10 \end{bmatrix}$ using Gauss-Jordan method and hence find the solution of the equations:

$$6x_1 + 3x_2 + 7x_3 = 7$$
$$x_1 + 5x_2 + 2x_3 = -7$$
$$7x_1 + 2x_2 + 10x_3 = 13$$

6) Compute the dominant latent root and the corresponding eigen vector of the following matrix:

$$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

7) Fit a function of the form $y = ax^b$ to the following data.

x	2	4	7	10	20	40	60	80
y	43	25	18	13	8	5	3	2

8) Using fourth order Runge-Kutta method with one step, compute $y(0.1)$ to five places of decimal, if

$y^1 = 0.31 + 0.25y + 0.3t^2$ and $y = 0.72$ when $t = 0$.

9) Compute $y(0.5)$, where y satisfy the following boundary value problem $\frac{d^2y}{dx^2} = y,\ y(0) = 0,\ y(1) = 1.8$ with $h = 0.25$ and compare it with exact solution.

Section - C $\quad$ 2 × 16 = 32

(Long Answer Questions)

Note: 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. Use of non-programmable scientific calculator is allowed in this paper.

10) Solve the system of equations by Crout's method :

$$2x_1 + 3x_2 + x_3 = 9$$
$$x_1 + 2x_2 + 3x_3 = 6$$
$$3x_1 + x_2 + 2x_3 = 8$$

11) Using Taylor's series method, find the solution of the initial value problem $\frac{dy}{dt} + y = -2t,\ y(0) = -1$ at $t = 0.2$ with $h = 0.1$ and compare the result with analytical solution.

12) Solve the boundary value problem $\frac{d^2y}{dt^2} = y,\ y(0) = 0,\ y(1) = 1.1752$ by shooting method.

13) Find all the roots of the polynomial equation $x^3 - 3x^2 - 6x + 8 = 0$ using Graeffe's root squaring method.
