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MA / MSC MT - 08

December - Examination 2015

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

Numerical Analysis

Paper - MA / MSC MT - 08

Time : 3 Hours] **[Max. 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 8 x 2 = 16

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 is 30 words.

1) (i) Write the formula of Regula - Falsi method.

(ii) Write the formula of Chebysehv method of third order.

(iii) Write condition on coefficient matrix A for solving simultaneous system of equations by Cholesky method.

(iv) Define Eigen values and Eigen vectors of a matrix.

(v) State principal of least square.

(vi) State orthogonal property of Chebyshev Polynomial.

(vii) Write the formula of Picard's method for solving differential equations of first order and first degree.

(viii) Write the formula of Miline's Predicator-Corrector method.

Section - B

4 x 8 = 32

Note : Section 'B' contain 8 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 equations using iteration method.

$x^2 + y^2 + xy - 7 = 0$

$x^3 + y^3 - 9 = 0$

3) Find all roots of given equation by Graffe's squaring method.

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

4) Use power method to obtain the dominant eigen value and corresponding vector of the matrix.

$$\begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$$

5) Use Given's method transform the following matrix in tri-diagonal form

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

6) Fit a curve $y = ax + bx^2$ to the following data:

x	1	2	3	4	5	6
y	2.6	5.4	8.7	12.1	16.0	20.2

7) Express $1 - x^2 + 2x^4$ as a sum of Chebyshev polynomials.

8) Use forth order Runge-Kutta method to compute $y(0.2)$, given that $\frac{dy}{dx} = -2x - y, y(0) = -1$ taking h = 0.2

9) Solve the BVP by finite difference method.

$\frac{d^2y}{dx^2} = -y, \quad y(0) + y'(0) = 2,$

$y\left(\frac{\pi}{2}\right) + y'\left(\frac{\pi}{2}\right) = -1$ by taking step size $h = \frac{\pi}{8}$.

Section - C 2 x 16 = 32

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.

10) Solve the BVP $\frac{d^2y}{dx^2} = y, \quad y(0) = 0, \quad y(0.4) = 0.4$

By Shooting method.

11) Compute $y(0.5)$ by Admas-Moulton method, given that

$\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$, $y(0.1) = 1.0954$, $y(0.2) = 1.1832$, $y(0.3) = 1.2649$

12) Find complex roots of equation $z^3 - 2z^2 + z - 2 = 0$ using Newton-Raphson method, taking initial approximation $z_0 = 0.5 + 0.5i$

13) Solve the following simultaneous system of equations using Crout's method.

$10x + y + z = 12$

$2x + 10y + z = 13$

$2x + 2y + 10z = 14$