MA/MSCMT-08

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

Section - A **8 × 2 = 16**

(Very Short Answer Questions)

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 may be thirty words.

1) (i) Write the rate of convergence of secant method.

(ii) Define Hermitian matrix.

(iii) Write normal equations for fitting the curve $y = ax + bx^2$

(iv) Write Taylor's series expansion of function $f(x) = \sin hx$ about $x = 0$.

(v) Write expansion of x^4 in terms of Chebyshev polynomials.

(vi) Define local truncation error.

(vii) Define Homogeneous boundary value problem.

(viii) Explain finite difference method.

Section - B **4 × 8 = 32**

(Short Answer Questions)

Note: Section 'B' contain Short Answer Type Questions. Examinees 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 a real root of equation $x^2 - \log_e x - 12 = 0$ in interval (3, 4) by using Regula-Falsi method correct to 2 decimal places.

3) Perform two iterations of Muller's method to find roots of equation $x^3 + 2x^2 + 10x - 20 = 0$ using intial approximations 0, 1 and 2.

4) Find a quadratic factor of polynomial $x^4 + 5x^3 + 3x^2 - 5x - 9 = 0$ using Bairstow's method by performing two iterations and taking initial approximation (3, – 5)

5) Performing two iterations of Jacobi's method, find all the eigen values and eigen vectors of the following matrix.

$$A = \begin{bmatrix} 1 & 1 & 0.5 \\ 1 & 1 & 0.25 \\ 0.5 & 0.25 & 2 \end{bmatrix}$$

6) If P is a pull required to lift a load W by means of a pulley block, find a linear law of the form P = mW + C connecting P and W, using the following data.

P	12	15	21	25
W	50	70	100	120

Compute P when W = 150 kg.

7) Use Picards method to find the fourth order approximate solution at $x = 0.2$ of the problem $\frac{dy}{dx} = 1 + xy,\ y(0) = 0$

8) Solve the BVP by Numerov method.
$\frac{d^2y}{dx^2} = x + y, \quad y(0) = 0, \quad y(1) = 0$ with step size $h = \frac{1}{4}$

9) Write a short note on conjugate - Gradient method for solving simultaneous system of equations.

Section - C **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.

10) Explain Stability analysis of

(i) Euler's Method

(ii) Runge-Kutta method of order two

(iii) Runge - Kutta method of order four

11) Solve the BVP

$\frac{d^2y}{dx^2} = y,\ y(0) = 0,\ y(1) = 1.1752$ by shooting method togther with Runge-Kutta method.

11) Explain Gram - Schmidt Orthogonalizing Process.

13) Find all the eigen values and eigen vectors of following matrix using given's method.

$$A = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 5 & 1 \\ 2 & 1 & 6 \end{bmatrix}$$

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