

**MA/MSCMT-08**

June - Examination 2018

**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. Write answers as per the given instructions. Use of non-programmable scientific calculator is allowed in this paper.

**निर्देश :** प्रश्न पत्र तीन खण्डों 'अ', 'ब' और 'स' में विभाजित है। प्रत्येक खण्ड के निर्देशानुसार प्रश्नों के उत्तर दीजिए।

**Section - A****8 × 2 = 16**

(Very Short Answer Type Questions)

**Note:** Section 'A' contain Eight (08) Very Short Answer Type Questions. Examinees have a attempt all questions. Each question is of 02 marks and maximum word limit may be thirty words.

- 1) (i) Write convergence rate of secant method.
- (ii) Define spectrum of a matrix.
- (iii) Write normal equations for fitting of a parabola  $y = a + bx + cx^2$
- (iv) Express  $2x^2 + 3x + 1$  as sum of Chebyshev polynomials.
- (v) Write corrector formula of Milne's Method.

- (vi) Write order of convergence of Chebyshev method for finding root of a equation.
- (vii) Write advantage of Graeff's root squaring method to other synthetic division methods.
- (viii) Define Lanczos Economization.

**Section - B**

**4 × 8 = 32**

(Short Answer Type Questions)

**Note:** Section 'B' contain Eight 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 square root of 10 using Newton-Raphson method.
- 3) Find the root of equation  $x^4 - x - 10 = 0$  using 3 iterations of Chebyshev method.
- 4) Explain Power method to find largest Eigen value of a matrix.
- 5) Using the Rutishauser method, find all the eigenvalues of the matrix.
- $$A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$$
- 6) Determine the best minimax approximation to the function  $f(x) = x^2$  on  $[0, 1]$  with a straight line.

- 7) Fit a curve of the form  $y = ax + bx^2$  to the given data:

X :	1	1.5	2	2.5	3	3.5	4
Y :	1.1	1.95	3.2	5	8.1	11.9	16.4

- 8) Compute  $x(0,1), y(0,1)$  by Taylor's series method where  $x(t)$  and  $y(t)$  satisfy the system of initial value problems

$$\frac{dx}{dt} = xy + 2t, \quad \frac{dy}{dt} = 2ty + x \text{ and } x(0) = 1, y(0) = 2.$$

- 9) Solve the boundary value problem

$$\frac{d^2y}{dt^2} = y \text{ and } y(0) = 0, y(1) = 1.2$$

by employing shooting method, take  $y'(0) = 0.85, 0.95$  as initial guesses.

### Section - C

$2 \times 16 = 32$

(Long Answer Type Questions)

**Note:** Section 'C' contain 4 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) Describe Bairstow's method to find roots of a equation.
- 11) Using Cholesky (square root) method solve the system of equations.

$$4x - y = 1$$

$$-x + 4y - z = 0$$

$$-y + 4z = 0$$

12) Explain stability analysis of

- (i) Euler's Method
- (ii) Runge-Kutta method of order two
- (iii) Runge-Kutta method of order four

13) (i) Solve the boundary value problem

$$\frac{d^2y}{dx^2} = x + y, y(0) = 0, y(1) = 0 \text{ by Numerov method with}$$

$$\text{step size } h = \frac{1}{4}.$$

(ii) Fit a curve of the form  $y = ax^b$  to the given data:

X :	2	3	4	5	6
Y :	144	172.8	207.4	248.8	298.5

—————