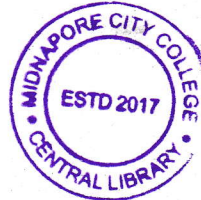


**PG (CBCS)**  
**M.Sc Semester- II Examination, 2023**  
**MATHEMATICS**  
**PAPER: MTM 202**  
**(NUMERICAL ANALYSIS)**

**Full Marks: 50****Time: 2 Hours**

The figures in the right-hand margin indicate full marks.  
 Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **FOUR** questions from the following: 4×2=08
- Explain the importance of weighted curve fitting.
  - Is LU decomposition method applicable to all systems of linear equation? Explain.
  - Can Power method be used to find the least eigen-value of a matrix? Explain.
  - What are the drawback of Jacobi's method for numerical eigenvalues and eigenvectors?
  - Explain, the iterative methods are better than the direct methods to solve the system of linear equation.
  - Discuss the merits and demerits of finite difference method to solve an ODE.
2. Answer any **FOUR** questions from the following: 4×4=16
- Describe approximation of a continuous function  $f(x)$  using orthogonal polynomials.
  - Find the value of  $\int_0^2 \frac{x}{1+x^3} dx$  using 6-point Gauss-Legendre quadrature formula.
  - Explain a suitable method to solve a tri-diagonal system of linear equations.
  - Use fourth order Runge-Kutta method to solve the second order initial value problem  $2y''(x) - 6y'(x) + 2y(x) = 4e^x$  with  $y(0) = 1$  and  $y'(0) = 1$  at  $x = 0.1$ .
  - Use Newton-Raphson method to solve the system  $x^2 - 2x - y + 0.5 = 0$ ,  $x^2 + 4y^2 - 4 = 0$  with the starting value  $(x_0, y_0) = (2.00, 0.25)$ .
  - Solve the following system of equations  

$$x = \frac{8x - 4x^2 + y^2 + 1}{8} \text{ and } y = \frac{2x - x^2 + 4y - y^2 + 3}{4}$$
 Starting with  $(x_0, y_0) = (1.1, 2.0)$  using fixed-point iteration.
3. Answer any **TWO** questions from the following: 2×8=16
- Use Jacobi's method to determine all eigenvalues and the eigenvectors of the real symmetric matrix  $A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 3 \end{pmatrix}$ .

*(P.T.O)*

(2)

- b) Define Spline interpolation. Fit a cubic spline for the points (0, 1), (1, 0), (2, 1), (3, 2), (4, 1) with the conditions  $y''(0) = y''(4) = 0$ . 2+6
- c) Describe Bairstow method to find all roots of a polynomial equation.
- d) Solve the system of equations

$$\begin{aligned}2x + 4y - 2z &= 14 \\x + 3y - 4z &= 16 \\-x + 2y + 3z &= 1\end{aligned}$$

using LU-decomposition method.



[Internal Assessment -10 Marks]

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