

Mid-West University
Examinations Management Office
End-Semester Examinations -2080

Bachelor level/ B.E. Computer/3rd Semester

Time: 3 hours

Subject: Numerical Methods (SH432/SH506)

Full Marks: 50

Pass Marks: 25

- Attempt all the questions
- Figures in the margin indicate full marks.
- Assume suitable values, with a stipulation, if necessary.
- Candidates are required to answer the questions in their own words as far as possible.

1. a) Discuss the difference between absolute error and relative error with appropriate example. [2]
- b) Find a root of the equation $\cos x = xe^x$ using the regula-falsi method correct up to four decimal places. [4]
- c) Using fixed-point iteration method, compute root of $x^2 - 2x = 3$. [4]

2. a) Using LU decomposition method, solve the following set of equations [4]
 $4x - 2y + z = 15$, $-3x - y + 4z = 8$, $x - y + 3z = 13$
- b) Find the largest eigenvalue and corresponding eigen vector of the following matrix using power Method. [4]

$$\begin{bmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{bmatrix}$$

3. a) From the following set of data, find the value of $f(9)$ using Lagrange Interpolation method. [4]

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

- b) Fit the following set of data into cubic splines to find $y(1.5)$ and $y(3.5)$. [4]

x	1	2	3	4
y	1	5	11	8

4. Using Simpson's 3/8 method, evaluate $\int_0^2 \left(\frac{x^2}{x^2+1} \right) dx$ [4]

5. a) Find $y(0.2)$ for $\frac{d^2y}{dx^2} = xdy/dx + yz - 4$, with step length 0.1 using Runge-Kutta-4 method [5]
Where, $y(0) = 0$ and $y'(0) = 1$.

- b) Use Euler's method with $h = 0.1$ to find approximate value of the IVP $y' + 2y = x^3 e^{-2x}$, [4]
 $y(0) = 1$ at $x = 0.2$ and 0.4 .

6. Solve the Poisson's equation $\nabla^2 f = x^3 y$ over the domain $3 \leq x \leq 6$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 1$. [4]

7. Write down algorithm, flowchart and code for Secant Method. [7]

The End