



Mahindra University Hyderabad
École Centrale School of Engineering
Minor-II Exam

Program: B. Tech. Branch: AI, CM, CE, CSE, ECM, NT, BTCM Year: II Semester: II
Subject: Numerical Methods (MA2208)

Date: 15/04/2025

Start Time: 10:00 AM

Time Duration: 1.5 Hours

Max. Marks: 20

Instructions:

- 1) Answer all the questions.
 - 2) All questions are self-explanatory; no clarification will be provided during the exam.
 - 3) Use of one non-programmable scientific calculator is allowed.
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Course outcomes (COs)

- CO 1: Solve non-linear and transcendental equations using various numerical methods, emphasizing order and convergence analysis.
- CO 2: Solve linear systems using direct and iterative schemes.
- CO 3: Utilize interpolation techniques and different numerical integration methods and understand their application in various scenarios.
- CO 4: Apply single-step and multi-step methods to numerically solve differential equations.
- CO 5: Develop Computational Skills: Utilize MATLAB programming to implement numerical algorithms for solving various equations and problems.

Q.No.	Questions	Marks	CO	BL	PO	PI Code												
1	Let $f(x) = 3^x$ for every $x \in \mathbb{R}$. Use Lagrange interpolation to find a polynomial of degree at most two that agrees with this function at the points $x_0 = 0$, $x_1 = 1$, and $x_2 = 2$.	5	CO3	L2	PO3	1.2.2												
2	Solve the following system of equations by Cholesky's method $\begin{aligned} 4x + 2y + 6z &= 16 \\ 2x + 82y + 39z &= 206 \\ 6x + 39y + 26z &= 113 \end{aligned}$	5	CO2	L2	PO3	1.2.2												
3	Rearrange the following system of equations, if necessary, to ensure convergence of the Gauss-Seidel method. Then, using the initial guess $x^{(0)} = 0, y^{(0)} = 0, z^{(0)} = 0$, perform two iterations of the method: $\begin{aligned} 27x + 6y - z &= 85 \\ x + y + 54z &= 110 \\ 6x + 15y + 2z &= 72 \end{aligned}$	5	CO2	L2	PO3	1.2.2												
4	Consider the following data <table border="1"><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>$f(x)$</td><td>2.9</td><td>1.2</td><td>0.5</td><td>1.6</td><td>3.9</td></tr></table> <p>(a) Assume the data can be approximated by a linear function of the form: $P_1 = ax + b$ Using the method of least squares, derive the normal equations.</p> <p>(b) Solve the normal equations to find the values of a and b.</p>	x	-2	-1	0	1	2	$f(x)$	2.9	1.2	0.5	1.6	3.9	5	CO3	L2	PO3	1.2.2
x	-2	-1	0	1	2													
$f(x)$	2.9	1.2	0.5	1.6	3.9													