

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTech  
BRANCH: BT/CE/CHEMICAL/FT/ME/PIE

SEMESTER : III/ADD  
SESSION : MO/2025

SUBJECT: MA24201 NUMERICAL METHODS

TIME: 02 Hrs.

FULL MARKS: 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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|--------|---|-----|-----|
| Q.1(a) | Round-off the following numbers to four significant figures:<br>38.46235, 0.70029, 0.0022218, 19.235101   | [2] | 1 2 |
| Q.1(b) | If $z = \frac{xy^3}{8}$ , Find the percentage error in z when $x = 3.14 \pm 0.0016$ and $y = 4.5 \pm 0.05$ .  | [3] | 1 2 |
| Q.2    | Find the estimate of the root of $4e^{-x}\sin x - 1 = 0$ by using the Newton-Raphson method. Assume that the initial guess of the root is 0.2. Conduct three iterations.  | [5] | 1 2 |
| Q.3    | Use the LU decomposition method to solve the following simultaneous linear equations.   | [5] | 2 2 |
|        | $\begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 9 \\ 6 \\ 8 \end{bmatrix}$   |     |     |
| Q.4(a) | Find the solution to the following system of equations using the Gauss-Seidel method.<br>$8x_1 + 2x_2 + 4x_3 = -16$ , $3x_1 + 5x_2 + x_3 = 4$ , $2x_1 + x_2 + 4x_3 = -12$<br>Use $(x_1, x_2, x_3) = (-1.0195, 2.0058, -2.9917)$ as the initial guess and conduct five iterations. | [5] | 2 2 |
| Q.5    | Find the Lagrange interpolating polynomial of degree 2 approximating the function $y = \ln x$ defined by the following table of values. Hence determine the value of $\ln 2.7$ .  | [5] | 3 2 |

$x$	2	2.5	3.0
$y = \ln x$	0.69315	0.91629	1.09861

:::::16/09/2025:::::E