BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : III/ADD**
BRANCH: Mech/Prod/Civil/Biotech/Chemical/Food Tech **SESSION : MO/2025**
SUBJECT: MA24201 NUMERICAL METHODS
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	if $u = 4x^2y^3/z^4$ and error in x, y, z are 0.001, compute the relative maximum error in $u \; when \; x = y = z = 1$.	[5]	1	2
Q.1(b)	Find the root of the equation $\cos x = xe^x$ in the interval (0.50995, 1) using the regula-falsi method correct to four decimal places.	[5]	1	3
Q.2(a)	Use LU Decomposition method to solve the following equation: $3x + 2y + 7z = 4; 2x + 3y + z = 5; 3x + 4y + z = 7.$	[5]	2	2
Q.2(b)	Solve by Jacobi's iteration method, the equations $10x + y - z = 11.19, \quad x + 10y + z = 28.08, \quad -x + y + 10z = 35.61,$ correct to two decimal places.	[5]	2	3
Q.3(a)	A curve passes through the points (0,18), (1,10), (3,-18) and (6,90). Find the slope of the curve at x=2.	[5]	3	2
Q.3(b)	Find the missing term in the following table using interpolation:	[5]	3	3

x:	0	1	2	3	4
y:	1	3	9	…	81

Q.4(a)	Evaluate the integral $\int_0^1 \frac{x^2}{1+x^2} dx$ using Simpson's 1/3 rule. Compare the error with the exact value. Take four equal parts of the interval.	[5]	4	2
Q.4(b)	Compute the value of the integral $\int_{0.2}^{1.4} (sinx - logx + e^x) dx$ using Simpson's 3/8 rule by taking seven ordinates.	[5]	4	3
Q.5(a)	Using modified Euler's method, find an approximate value of y when x=0.2 and 0.4, given $\frac{dy}{dx} = y + e^x \; and \; y = 0 \; when \; x = 0$. Take h=0.2.	[5]	5	2
Q.5(b)	Using the Runge-Kutta method of fourth order, solve for y at x=1.2 and 1.4 from $\frac{dy}{dx} = \frac{2xy + e^x}{xe^x + x^2} \; given \; y(1) = 0.$	[5]	5	3

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