BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2023)

CLASS: BTECH
BRANCH: ECE/EEE/CSE/IT

SEMESTER: IV
SESSION: SP/2023

SUBJECT: MA203 NUMERICAL METHODS

TIME: 02 Hours

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.

			CO	BL
Q.1(a)	How many number of significant digits in the following (i) 0.0459 (ii) 4.590 (iii) 1.079×10^3 (iv) 1.0790×10^3	[2]	1	2
Q.1(b)	The derivative of a function $f(x)$ at a particular value of x can be approximately calculated by $f'(x) \approx \frac{f(x+h)-f(x)}{h}$ of $f'(2)$ For $f(x) = 7e^{0.5x}$ and $h = 0.3$, find (a) the approximate value of $f'(2)$, (b) the true value of $f'(2)$, (c) the true error for part (a).	[3]	1	2
Q.2(a)	One root of the equation lies in the interval (3,4). Find the least number of iterations needed for the bisection method so that $\|error\| \le 10^{-3}$	[2]	1	2
Q.2(b)	Solve the following $xe^x = \cos x$ using Regula-false method correct to two decimal places.	[3]	1	3
Q.3(a)	Find the LU decomposition of the matrix $[A] = \begin{bmatrix} 25 & 5 & 1 \\ 64 & 8 & 1 \\ 144 & 12 & 1 \end{bmatrix}$	[2]	2	3
Q.3(b)	Find the solution using Gaussian elimination with partial pivoting using five significant digits with chopping in your calculations $20x_1 + 15x_2 + 10x_3 = 45$ $-3x_1 - 2.249x_2 + 7x_3 = 1.751$ $5x_1 + x_2 + 3x_3 = 9$	[3]	2	3
Q.4	Find the solution to the following system of equations using the Gauss-Seidel method. $12x_1 + 3x_2 - 5x_3 = 1$ $x_1 + 5x_2 + 3x_3 = 28$ $3x_1 + 7x_2 + 13x_3 = 76$ Use $(x_1, x_2, x_3) = (1,0,1)$ as the initial guess and conduct five iterations.	[5]	2	3
Q.5	Find a cubic polynomial using Lagrange's formula for the data: x: -2 -1 1 3 f(x): -1 3 -1 19 then evaluate f(0) and f'(0).	[5]	3	3

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