BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION SP2023)

CLASS: BTECH **SEMESTER: IV**
BRANCH: ECE, EEE, CSE, IT **SESSION: SP/2023**

SUBJECT: MA203 NUMERICAL METHODS

TIME: 03 Hours **FULL MARKS: 50**

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)	Find the negative root of $x^3 - 4x + 9 = 0$ lying between 2 and -3 using Bisection Method. Perform five iterations only correct to three decimal places.	[5]	1	2
Q.1(b)	Use the method of iteration to solve the equation $3x - \log_{10} x = 6$. Take initial approximation $x_0 = 2$.	[5]	1	3
Q.2(a)	Solve the following system of equations using Gauss-Elimination method. $5x - 2y + 3z = 18$, $x + 7y - 3z = -22$, $2x - y + 6z = 22$	[5]	2	2
Q.2(b)	Find the solution of the system. $28x + 4y - z = 32$, $2x + 17y + 4z = 35$, $x + 3y + 10z = 24$ with initial approximation $(x_0, y_0, z_0) = (0,0,0)$ correct to 4 decimal place using Gauss Seidel method.	[5]	2	3
Q.3(a)	Find the value of y at $x = 6$ from the following data.	[5]	3	2

x	3	7	9	10
y	168	120	72	63

Q.3(b)	Find $y'(0.5)$ and $y''(0.5)$ from the following data.			3	3

x	0	1	2	3	4
$f(x)$	1	1	15	40	85

Q.4(a)	On dividing the interval into 10 equal parts and applying Simpson's 1/3rd rule, find the value of the integral $\int_0^5 \frac{dx}{4x+5}$ correct to 4 decimal places.	[5]	4	3
Q.4(b)	Evaluate $\int_{1.0}^{1.3} \sqrt{x}\, dx$ taking $h = 0.05$ by Trapezoidal rule.	[5]	4	2
Q.5(a)	Consider the initial value problem (IVP) $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$. Taking step size $h = 0.02$, find the value of $y(0.1)$ using Euler's method correct to 4 decimal places.	[5]	5	2
Q.5(b)	Consider the initial value problem (IVP) $\frac{dy}{dx} = \mathrm{x} + \mathrm{y}, y(0) = 1$. Taking step size $h = 0.1$, find the value of $y(0.2)$ using Runge-Kutta fourth order method correct to 4 decimal place	[5]	5	3

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