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

CLASS: M. Tech. **SEMESTER : I**
BRANCH: SER **SESSION : MO/2025**

SUBJECT: SR513 APPLIED MATHEMATICS

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 hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Find a root of the equation $x \log_{10} x = 1.9$ correct to three decimal places by the secant method.	[5]	CO1	III
Q.1(b)	Derive Newton-Raphson method to find the root of an equation $f(x) = 0$.	[5]	CO1	II
Q.2(a)	From the following table find y when x = 2.4 by Newton's interpolation formula:	[5]	CO2	III

x:	1.7	1.8	1.9	2.0	2.1	2.2	2.3
$y=e^x$:	5.474	6.050	6.686	7.389	8.166	9.025	9.974

Q.2(b)	Using Newton's divided differences formula, evaluate f(8) from the given data:					[5]	CO2	III
	x:	4	5	7	10	11	13
	y=f(x):	48	100	294	900	1210	2028

Q.3(a)	From the following values of x and y, find dy/dx when x = 1:							[5]	CO3	III
	x:	0	1	2	3	4	5	6		
	y:	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309		
Q.3(b)	Evaluate by Simpson's 3/8 rule:							[5]	CO3	III

$$\int_0^9 \frac{dx}{1+x^3}$$

Q.4(a)	Derive the Euler's method to solve the differential equation $dy/dx = f(x,y)$ with the initial condition $y(x_0) = y_0$.	[5]	CO4	III
Q.4(b)	Using Taylor 's series, find y(0.1), given that $dy/dx = xy + y^2$, $y(0) = 1$.	[5]	CO4	III
Q.5(a)	Classify the partial differential equation $f_{xx} + 4f_{xy} + f_{yy} = 0$ and comment on the nature of the solution.	[5]	CO5	II
Q.5(b)	Discretize the Laplace equation $\partial^2u/\partial x^2 + \partial^2u/\partial y^2 = 0$ using finite difference method and show the Jacobi's method solve it.	[5]	CO5	II

:::::25/11/2025:::::