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

CLASS: MTECH **SEMESTER : I**
BRANCH: SER **SESSION : MO/2022**

SUBJECT: SR513 APPLIED MATHEMATICS

TIME: 3:00 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.

Q.1(a) Using Newton-Raphson method, find the root of the equation $\mathbf{x \sin x + \cos x = 0}$ correct to three decimal places. [5]

Q.1(b) Solve by Jacobi's method, the equations: 5x - y + z =10; 2x + 4y = 12; x + y + 5z = -1; starting with the solution (2, 3, 0). [5]

Q.2(a) The area A of a circle of diameter d is given for the following values: [5]

d:	80	85	90	95	100
A:	5026	5674	6362	7088	7854

Calculate the area of a circle of diameter 105.

Q.2(b) Find y(2) from the following data using Lagrange's formula, [5]

x:	0	1	3	4	5
y:	0	1	81	256	625

Q.3(a) The distance (x cm) traversed by a particle at different times (t seconds) are given below. [5]

t:	0.0	0.1	0.2	0.3	0.4	0.5	0.6
x:	3.01	3.16	3.29	3.36	3.40	3.38	3.32

Find the velocity of the particle at t = 0.3 seconds.

Q.3(b) Evaluate $\int_0^2 \frac{1}{x^3+x+1}\,dx$ by Simpson's 1/3 – rule with h = 0.25. [5]

Q.4(a) Using Euler's method solve for y at x = 0.1 from $\frac{dy}{dx} = x + y + xy$, y(0) = 1, taking step size h = 0.025. [5]

Q.4(b) Using Runge-Kutta method of order 4, compute y(0.2) from $10\frac{dy}{dx} = x^2 + y^2$, y(0) = 1, taking h = 0.1. [5]

Q.5(a) Classify the equation $x^2\frac{\partial^2 u}{\partial x^2} + (1 - y^2)\frac{\partial^2 u}{\partial y^2} = 0, -\infty < x < \infty, -1 < y < 1.$ [5]

Q.5(b) Write down the Crank-Nicolson method for $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$, where c is a constant and show the Jacobi's method to solve this implicit scheme. [5]

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