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

CLASS: MTECH. **SEMESTER : I**
BRANCH: SER **SESSION : MO/2024**

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 real root of the equation 2x - 3 = cos x correct to three decimal places using iteration method.	[5]	CO 1	III
Q.1(b)	Using the Gauss elimination method, solve the equations: x + 2y + 3z – u = 10, 2x + 3y – 3z – u = 1, 2x – y + 2z + 3u = 7, 3x + 2y – 4z + 3u = 2.	[5]	CO 1	III
Q.2(a)	Prove that the n^{th} differences of a polynomial of the n^{th} degree are constant.	[5]	CO 2	III
Q.2(b)	Find y(2) from the following data using Lagrange's formula x: 0 1 3 4 5 y: 0 1 81 256 625	[5]	CO 2	III
Q.3(a)	Find the value of cos (1.74) from the following table: x: 1.7 1.74 1.78 1.82 1.86 sin x: 0.9916 0.9857 0.9781 0.9691 0.9584	[5]	CO 3	III
Q.3(b)	Using three-point Gaussian quadrature formula, evaluate $\int_{-1}^{1} \frac{1}{1+x^2}\,dx$.	[5]	CO 3	III
Q.4(a)	Using Euler's method, solve the differential equation $dy/dx = 1+ y^2$ with the initial condition y = 0 when x = 0.	[5]	CO 4	III
Q.4(b)	Using the Runge-Kutta method of fourth order, solve $dy/dx = (y^2 - x^2)/(y^2 + x^2)$ when y(0) = 1 at x = 0.2.	[5]	CO 4	III
Q.5(a)	Classify the steady two-dimensional velocity potential equation, $(1 - M^2)\partial^2\varphi/\partial x^2 + \partial^2\varphi/\partial y^2 = 0$ where, M is Mach number.	[5]	CO 5	III
Q.5(b)	Discretize 1-D unsteady heat conduction equation $\partial u/\partial t = c^2\, \partial^2 u/\partial x^2$ using Crank-Nicolson method and show the Gauss-Seidel method to solve it (where, c is a constant).	[5]	CO 5	III

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