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

CLASS: IMSc — **SEMESTER : IV/ VI**
BRANCH: MATHS & COMPUTING — **SESSION : SP/2023**

SUBJECT: MA311 NUMERICAL TECHNIQUES

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)	Perform four iterations of the secant method to determinate real root of $cos\ x - x\ e^x = 0$ in the interval $[0,1]$ with $x_0 = 0, x_1 = 1$.	[5]	1	2
Q.1(b)	Prove that the secant method has 1.618 convergence rate.	[5]	2	3
Q.2(a)	Apply the Gauss elimination method to find the solution of: $10x - y + 2z - 4\ ;\ x + 10y - z - 3;\ 2x + 3y + 20z - 7$.	[5]	2	2
Q.2(b)	Determine the Euclidean and the maximum absolute row sum norms of the matrix, $\begin{pmatrix} 1 & 4 & 9 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{pmatrix}$.	[5]	2	2

Q.3(a) Find the missing term in the following table: [5] 3 2

x	0	1	2	3	4
f(x)	1	2	9	k	81

Q.3(b) Using suitable interpolation formula, compute $f(2.8)$ from the following table: [5] 3 2

x	0	1	2	3
f(x)	1	2	11	34

Q.4(a) By dividing the interval [0,4] into 8 equal parts and applying Simpson's 1/3rd rule to compute the value of $\int_0^4 \frac{dx}{1+x}$. [5] 4 2

Q.4(b) Find the value of $\int_0^1 \frac{dx}{1+x^2}$ taking 5 sub-intervals by Trapezoidal rule correct to five significant figures. [5] 4 2

Q.5 Using fourth order R-K Method, evaluate $y(1.1)$ given for given IVPs: [10] 5 3

$y' - \frac{1}{x^2} - \frac{y}{x};\ y(1) - 1$ with $h - 0.1$.

::::::24/04/2023::::::M