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

CLASS: MTECH **SEMESTER : I**
BRANCH: MECHANICAL ENGINEERING **SESSION : MO/2024**

SUBJECT: ME521 COMPUTATION METHODS IN ENGINEERING

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)	Solve the following equations by Gauss – Jordon method : $X + y + z = 9$ $2x - 3y + 4z = 13$ $3x + 4y + 5z = 40$	[5]	CO2	3
Q.1(b)	Find a Q R factorization 0f a matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & -1 & 1 \end{bmatrix}$ And also check Q R → A or not.	[5]	CO1	5
Q.2(a)	Using the Secant method find an approximate value of $\sqrt{12}$ of correct to three decimal places.	[5]	CO1	5
Q.2(b)	By means of Lagrange's formula , show that $y_1 = y_3 - 0.3 (y_5 - y_{-3}) + 0.2 (y_{-3} - y_{-5})$	[5]	CO2	2
Q.3(a)	Evaluate $\int_{-1}^{1} \frac{1}{1+x2} \; dx$ Using (i) one point Gaussian formula (ii) two point Gaussian formula	[5]	CO3	5
Q.3(b)	Use Romberg's method or integration to compute $\int_{0}^{1} \frac{1}{1+x2} \; dx$, correct to three decimal places taking h= 0.5 , 0.25 and 0.125 and also find the approximate value of π .	[5]	CO3	3
Q.4(a)	Check a criteria for stability of the system $\frac{dy}{dx} = -y$ Using the Euler's method.	[3]	CO1	4
Q.4(b)	Using Adams- Bash- forth Moulton method find Y(0.4) if f(x,y) = $\frac{dy}{dx} = 0.5\,xy$ *using table given below* :	[7]	CO4	5

x	y
0	0
0.1	1.01
0.2	1.022
0.3	1.023

Q.5(a)	Develop a Crank – Nicholson's scheme formula and using derived scheme solve for $U_{xx} = 16\, u_t$, $0 < x < 1$, $t > 0$ Given u(x,0) =0 , u(0,t)=0 and u(1,t)= 100t Simulate u in t direction taking h=0.25.	[10]	CO5	6

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