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

CLASS: IMSc **SEMESTER : III**
BRANCH: QEDS **SESSION : MO/2025**

SUBJECT: ED24201 DIFFERENTIAL EQUATIONS

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 first-order differential equation: $y' + y = e^t$.	[5]	1	
Q.1(b)	Solve the initial value problem: $y' = y^2 + t^2,\ y(0) = 1.$	[5]	1	
Q.2(a)	Solve: $y'' - 3y' + 2y = 0.$	[5]	2	
Q.2(b)	Find the general solution of $y'' + y = \sin(t)$.	[5]	2	
Q.3(a)	Find the first four terms of the series solution about $t = 0$ for $y'' - ty' - y = 0.$	[5]	3	
Q.3(b)	Obtain the series solution near $t = 0$ for $y'' + y = 0.$	[5]	3	
Q.4(a)	Solve using Laplace transform: $y'' + 4y = 0,\ y(0) = 1,\ y'(0) = 0,$	[5]	4	
Q.4(b)	Solve using Laplace transform: $y'' - 3y' + 2y = e^t,\ y(0) = 1, y'(0) = 0.$	[5]	4	
Q.5(a)	Solve the system: $\dot{x} = Ax, x(0) = \begin{pmatrix}1\\0\end{pmatrix}$, where $A = \begin{pmatrix}1 & 1\\1 & -1\end{pmatrix}, x = \begin{pmatrix}x_1\\x_2\end{pmatrix} \in \mathbb{R}^2$	[5]	5	
Q.5(b)	Solve the system: $\dot{x} = Ax, x(0) = \begin{pmatrix}1\\-1\end{pmatrix}$, where $A = \begin{pmatrix}2 & 1\\-1 & 1\end{pmatrix}, x = \begin{pmatrix}x_1\\x_2\end{pmatrix} \in \mathbb{R}^2$	[5]	5	

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