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

CLASS: BSC **SEMESTER : I**
BRANCH: Maths & Comp **SESSION : MO/2025**

SUBJECT: MA25111 ORDINARY 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 following differential equation: $(y\ sin\ 2x)dx - (1 + y^2 + cos^2 x)dy = 0$	[5]	1	1
Q.1(b)	Find general of the following differential equation: $y = 2px + p^2$	[5]	1	1
Q.2(a)	Show that the functions x and xe^x are linearly independent. Hence, set up the differential equation having them as its independent solutions.	[5]	2	2
Q.2(b)	Solve the following differential equation: $y''-y = x^2 + \cos x + e^x$	[5]	2	2
Q.3(a)	Solve the simultaneous differential equations: $\frac{dx}{dt} + x - y = e^t$; $\frac{dy}{dt} - x + y = e^t$	[5]	3	2
Q.3(b)	Verify that $x(y^2 - 1)\ dx + y(x^2 - z^2)\ dy - z(y^2 - 1)\ dz = 0$ is integrable. Then solve the differential equation.	[5]	3	2
Q.4(a)	Find the power series solution of the equation: $(x^2 + 1)y'' + xy'-xy = 0$ about $x = 0$.	[5]	4	1
Q.4(b)	Express $f(x) = x^3 - 6x^2 + 5x - 3$ in terms of Legendre polynomials.	[5]	4	2
Q.5(a)	Apply Picard's method to solve the following initial value problem upto third approximation: $\frac{dy}{dx} = e^x + y^2, \qquad y(0) = 1$	[5]	5	2
Q.5(b)	Find the eigenvalues and the corresponding eigenfunctions of the following Strum-Liouville problem: $y''(x) + \lambda y(x) = 0,\ 0 \le x \le L,\ y(0) = 0,\ y'(L) = 0.$	[5]	5	2

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