

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: IMSC
BRANCH: Maths & Comp

SEMESTER : II
SESSION : SP/2024

SUBJECT: MA106R1 ORDINARY DIFFERENTIAL EQUATIONS

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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		CO	BL
Q.1(a)	Find the values of constant λ such that the differential equation: $(3x^2 + \lambda e^y)dx + (2xe^y + 3y^2)dy = 0$ is exact. Further, for this value of λ , solve the equation.	[2] 1	1
Q.1(b)	Find the orthogonal trajectories of family of curves: $y = cx^2$, c being a parameter.	[3] 1	1
Q.2(a)	Solve the following differential equation: $x^2p^2 + xyp - 6y^2 = 0$	[2] 1	2
Q.2(b)	Find general and singular solutions of the following differential equation: $xp^2 = (x - a)^2$	[3] 1	1
Q.3(a)	Find the unique solution of the initial value problem: $y'' = 1$ with $y(0) = 1$, $y'(0) = 2$	[2] 2	1
Q.3(b)	Prove that $\sin 2x$ and $\cos 2x$ are two linearly independent solutions of $y'' + 4y = 0$.	[3] 2	2
Q.4	Solve the following differential equation: $(D^2 + D - 6)y = \sin x + e^{2x}$	[5] 2	2
Q.5	Solve by the method of variation of parameters: $[D^2 + 2D + 1]y = \frac{1}{x^2e^x}$	[5] 3	2

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