BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: IMSc **SEMESTER : II**
BRANCH: MATHEMATICS **SESSION : SP/2023**

SUBJECT: MA106 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**

			CO	BL
Q.1(a)	Find a one parameter family of solution of the Clairaut equation $y = px + p^3, p \equiv d/dx$	[2]	CO1	BT1
Q.1(b)	Determine if the given equation is exact and hence solve: $(2xy + 1)dx + (x^2 + 4y)dy = 0$.	[3]	CO2	BT4
Q.2(a)	Find the orthogonal trajectories of the family of curves $y = cx^3$	[2]	CO1	BT1
Q.2(b)	Solve the given differential equation: $\frac{dy}{dx} + 3\frac{y}{x} = 6x^2$.	[3]	CO1	BT3
Q.3	Solve the Cauchy-Euler equation $x^2\frac{d^2y}{dx^2} - 5x\frac{dy}{dx} + 8y = 2x^3$.	[5]	CO1	BT3
Q.4	Find the general solution of the non-homogeneous differential equation by the method of undetermined coefficients: $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4x^2$.	[5]	CO1	BT1
Q.5(a)	Solve the simultaneous differential equation $\frac{dx}{dt} = 6x - 3y; \frac{dy}{dt} = 2x + y$.	[5]	CO1	BT3

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