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

CLASS: IMSc/MSc **SEMESTER : VII / I**
BRANCH: PHYSICS **SESSION : MO/2024**

SUBJECT: PH403 CLASSICAL MECHANICS

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)	Define degrees of freedom, constraints, generalized coordinates, generalized momenta and a conservative system.	[5]	1	1
Q.1(b)	Write down the expression for the Lagrange's equation of motion. Determine the Lagrangian and Lagrange's equation of motion for a simple pendulum.	[5]	1	1,3
Q.2(a)	Define Hamiltonian and derive Hamilton's equations of motion.	[5]	2	1,2
Q.2(b)	Derive Hamiltonian and Hamilton's equations of motion for a one-dimensional harmonic oscillator.	[5]	2	1,2,3
Q.3(a)	State the conditions for a canonical transformation.	[5]	3	2
Q.3(b)	State and prove Poisson's theorem.	[5]	3	1,3
Q.4(a)	Define inertial frames, non-inertial frames, fictitious and Coriolis forces.	[5]	4	1
Q.4(b)	Derive the expression for rotational kinetic energy of a rigid body.	[5]	4	4
Q.5(a)	Explain stable, unstable and neutral equilibrium. Also, provide a brief discussion on potential energy of a one-dimensional oscillator for oscillation around a position of stable equilibrium.	[5]	5	4
Q.5(b)	Derive equations of motion for a double pendulum.	[5]	5	3,4

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