

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

CLASS: IMSc
BRANCH: PHYSICS

SEMESTER : V
SESSION : MO/2024

SUBJECT: PH203 CLASSICAL DYNAMICS

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)	State Newton's three laws of motion.	[2] 1	1,2
Q.1(b)	What is the principle of superposition of forces?	[3]	
Q.2(a)	What is the physical significance of the cyclotron frequency $\omega = qB/m$?	[2] 1	2
Q.2(b)	For a particle of charge +q being acted upon by a magnetic field in the y-direction, set up the equations of motion by using the Lorentz Force Law (no need to solve them).	[3] 1	2,3
Q.3(a)	What is the advantage of using generalized coordinates? Is the set of generalized coordinates unique?	[2] 2	2
Q.3(b)	Find the equation of motion of a mass 'm' attached to a wall by means of a spring of spring constant 'k', using the Euler-Lagrange equation.	[3] 2	3
Q.4(a)	How are the Lagrangian and the Hamiltonian related? What is the transformation called?	[2] 2	1,2
Q.4(b)	Using the above relation, derive the Hamilton's equations of motion.	[3] 2	2
Q.5(a)	Mathematically show that for small enough displacements of a body from its equilibrium position, the potential acting on it can be approximated by a harmonic potential.	[2] 3	3
Q.5(b)	Derive the equation $ V_{jk} - \omega^2 T_{jk} = 0$, starting from the quadratic forms of the kinetic and the potential energies.	[3] 3	2,3

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