Reg. No										

AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M. Sc. (First Semester - Regular) Examinations, February – 2025

24MPHPC11002 – Classical Mechanics

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** the questions	CO #	Blooms Level
a. What do you mean by principal axis of a rigid body?	CO1	K1
b. What is the superiority of Lagrangian mechanics over Newtonian approach?	CO2	K2
c. Why the 2nd generating function is expected to be the most versatile one in canonical transformation.	CO3	K2
d. Mention the Poisson's bracket of angular momentum.	CO4	K1
e. A particle of unit mass moves in a potential $V(x) = ax^2 + b/x^2$, where a and b are constants. What is the angular frequency of small oscillation about the minimum potential position?	CO5	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2.a. Define Euler's angles and obtain an expression for complete transformation matrix.	8	CO1	K1
b. Explain degree of freedom of a rigid body	2	CO1	K1
(OR)			
c. What do you mean by inertia tensor? Establish the relation between Inertia tensor and angular momentum vector.	6	CO1	K1
d. How will you determine the principal moment of inertia of a rigid body and its direction?	4	CO1	K1
3.a. Derive Lagrange's equation from D'Alemberts principle.	8	CO2	K1
b. Write down the Lagrangian of a charged particle moving in an electromagnetic field.	2	CO2	K2
(OR)			
c. Derive Hamilton's equation of motion.	8	CO2	K1
d. Find the Hamiltonian corresponds to the Lagrangian $L = ax^2 + by^2 - kxy$	2	CO2	K2
4.a. Discuss in details about canonical equation	8	CO3	K1
b. Show that the transformation $Q = 1/p$ and $P = qp^2$ is canonical.	2	CO3	K2
(OR)			
c. Show that Poisson's bracket is invariant under canonical transformation.	8	CO3	K2
d. What is Jacobi"s Identity?	2	CO3	K1
5.a. Discuss the general theory of small oscillation	8	CO4	K1
b. What do you mean by stable and unstable equilibrium?	2	CO4	K1
(OR)			
c. Discuss Integral Invariance of Poincare.	7	Co3	K1
d. Explain Legender transformation with a suitable example.	3	Co3	K1
6.a. Discuss the normal mode of oscillation of a two coupled oscillator system.	8	Co4	K1

b.	What do you mean by symmetric and anti-symmetric mode?	2	Co4	K1
	(OR)			
c.	Discuss two coupled pendulums in normal mode of oscillation with matrix formalism.	8	CO4	K1
d.	What do you mean by stable and unstable equilibrium?	2	CO4	K1

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