MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

REG NO										

DEPARTMENT OF SCIENCES

FIRST SEMESTER M.Sc (PHYSICS) END SEMESTER EXAMINATION, FEBRUARY 2021

SUB: CLASSICAL MECHANICS (PHY- 5152)

TIME: 3 HRS. **DATE: 10-02-2021** MAX. MARKS : 50

NOTE: ANSWER ALL FIVE FULL QUESTIONS.

1A What do you mean by Conservative Force fields? Explain. [2]

1B Write an equation of motion for a particle moving vertically downwards under the action of gravity and air resistance proportional to its velocity. Solve it to get the position at any time. Obtain the expression for terminal velocity. [5]

1C Show that kinetic energy of a system of particles is the sum of KE of centre of mass (c.m.) about a fixed point (O) and the KE of the system about the c.m. [3]

2A. State Kepler's three laws of planetary motion. Prove the Kepler's 3rd law of motion. [3]

2B Show that the angular acceleration is the same in the fixed and rotating frames. [3]

2C Obtain Lagrange's Equations of motion for a conservative holonomic constraints using from D'Alembert's equations of motion. [4]

3A Obtain Lagrangian in the case of Atwood's machine and hence obtain the equations of motion. [4]

3B What do you mean by the inertia tensor? Write an expression for angular momentum of a rigid body in terms of inertia tensor. When are the products of inertia zero? [3]

3C Obtain Euler's equations of motion of a rigid body [3]

4A Derive Hamilton's equations of motion using Lagrange's equations. [3]

4B Obtain equations of motion for a simple pendulum with moving support [6]

4C What do you mean by Euler angles? [1]

5A What you mean by generating functions? Explain. [3]

5B Define Poisson Bracket and show that a function whose Poisson Bracket with the Hamiltonian vanishes is a constant of motion. [4]

5C

$(q, p) \rightarrow (Q, P)$ to be canonical show that [3]

$$\frac{\partial P}{\partial q} = \frac{\partial p}{\partial Q} \quad \& \quad \frac{\partial P}{\partial p} = -\frac{\partial q}{\partial Q}$$

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