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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- 4102)-Old Scheme

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

NOTE: ANSWER ALL FIVE FULL QUESTIONS.

1A Show that the total energy of a particle in a conservative field is constant, if potential energy is not depending on time. [3]

1B Write the equations governing the particles in Atwood's machine. Solve them to get acceleration of the particles and tension in the string. [3]

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. [4]

2A. State Kepler's three laws of planetary motion. Prove the Kepler's 3rd law of motion. [4]

2B What do you mean by bounded & unbounded motion? How does a two-body problem reduce to a one-body problem in a central force field? explain. [6]

3A Obtain Lagrange's Equations of motion for a conservative holonomic constraints using from D'Alembert's equations of motion. [5]

3B Show that the angular acceleration is the same in the fixed and rotating frames. [5]

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

4B Transform the coordinates of linear harmonic oscillator using the generating function $(\frac{1}{2})m\omega q^2 \cot Q$, obtain the new Hamiltonian and hence obtain its solution. [4]

4C What do you mean by Euler angles? [2]

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

5B [5]

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

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