MANIPAL ACADEMY of HIGHER EDUCATION

Reg. No.										

DEPARTMENT OF SCIENCES, I SEMESTER M.Sc (PHYSICS)
MAKE UP EXAMINATIONS, DECEMBER 2019
SUBJECT [CODE- 4103]
(REVISED CREDIT SYSTEM-2018)

Time: 3 Hours **Date: 24/12/2019** **MAX. MARKS: 50**

Note: (i) Answer **ALL** questions
(ii) Draw diagrams, and write equations wherever necessary

1 A. (a). Show that the total energy of a particle in a conservative field is constant, if potential energy does not depend on time.

(b). Discus reduction in velocity of the projectile under resistive force.

[3+ 2 = 5]

1 B. (a). In a conservative central force field show that the areal velocity of the system of two bodies is constan**t.**
(b). State Kepler's three laws of planetary motion.
. **[3 + 2 = 5]**

2 A. (a). Show that the plane of oscillation of Foucault pendulum at latitude rotates through $2\pi \sin\theta$ every day.

(b). What do you mean by Coriolis force? Explain. **[3 + 2 = 5]**

2 B. (a). State and explain D'Alembert's Principle of virtual work.

(b). Obtain the expression for kinetic energy in terms of generalized coordinates when constraints are scleronomous. **[2 + 3 = 5]**

3 A. (a) Using Lagrangian equation of motion, obtain the expressions for the force '**F**' having components F_x, F_y, and F_z along the three axes of the Cartesian coordinates, acting on a body of mass 'm' is moving with a kinetic energy
(b). Obtain Lagrangian for a simple pendulum and hence obtain the equations of motion.

[2 + 3 = 5]

(PTO)

3 B. (a). What do you mean by the inertia tensor? Write an expression for angular momentum of a rigid body in terms of inertia tensor.
(b). Obtain Euler's equations of motion of a rigid body **[2 + 3 = 5]**

4 A.(a). Using Euler-Lagrange equation show that the shortest distance between two points in a plane is a straight line.
(b). What do you mean by phase space? Explain. **[3 + 2 = 5]**

4B (a).What you mean by generating functions? Explain.
(b). Consider the generating function of the type : $F_2 = \sum_i q_i P_i$
Show that function generates the identity transformations. **[3 + 2= 5]**

5 A. (a). Define Poisson Bracket and show that a function whose Poisson Bracket with the Hamiltonian vanishes is a constant of motion.
(b**).** [u, v] = −[v, u] POISSON BRACKETS ARE ANTICOMMUTATIVE
[3+ 2= 5]

5 B. Show that the motion of two particles in a coupled oscillators is a superposition of two harmonic vibrations of frequencies.
[5]

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