18PHP05

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – **PHYSICS**

CLASSICAL MECHANICS

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. Find the Constraints are _____ imposed on the position or motion of a system, because of geometrical conditions.
   (a) Restrictions (b) Variables
   (c) States (d) Parameters

2. Choose the path of the planets about the sun is _____ in shape, with the center of the sun being located at one focus.
   (a) Circle (b) elliptical
   (c) Rectangular (d) Hyperbolic

3. Identify the cone described by the angular velocity vector is known as _____.
   (a) surface cone (b) body cone
   (c) volume cone (d) precession cone

4. Indicate the principle of least action for conservative system is expressed as ___.
   (a) $\int_{t_1}^{t_2} \sum_j p_j \dot{q}_j \, d_t = 0$ (b) $\Delta \int_{t_1}^{t_2} \sum_j p_j \dot{q}_j \, d_t = \infty$
   (c) $\Delta \int_{t_1}^{t_2} \sum_j p_j \dot{q}_j \, d_t = 0$ (d) $\int_{t_1}^{t_2} \sum_j p_j q_j \, d_t = 0$

5. The frequency of linear harmonic oscillator is _____.
   (a) $\nu = \frac{1}{\pi}\sqrt{\frac{k}{m}}$ (b) $\nu = \frac{1}{2\pi}\sqrt{km}$
   (c) $\nu = 2\pi\sqrt{\frac{k}{m}}$ (d) $\nu = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a State and explain D'Alemberts principle.
OR
b What are constraints? Write their types.

7 a State and explain the Virial theorem.
OR
b Write a note on scattering in a central force field.

8 a Derive Euler's equations of motion.
OR
b Write a note on infinitesimal rotations.

9 a Define Poisson bracket. Explain the properties of poisson brackets.
OR
b Explain the Hamilton's canonical equations of motion.

Cont...

10 a Produce the normal coordinates and normal frequencies of a linear triatomic molecule.

OR

b Explain Keplers problem action angle variables.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Derive Lagrange's equation of motion from D'Alembert's Principle.

OR

b Analyze Lagrange's equation of motion to the simple pendulum to find the time period of the system.

12 a Discuss the concept of inverse square law from the Kepler's problem.

OR

b Discuss the reduction of central force problem to the equivalent one body problem.

13 a Identify the equation of motion of a spinning top.

OR

b Elucidate infinitesimal rotations and coriollis force.

14 a State and explain the principle of least action.

OR

b Examine the cyclic coordinates and conservation of the generalised momentum.

15 a Compare the normed modes and normed Coordinates.

OR

b Derive Hamilton – Jacobi equation for Hamilton's principle.

Z-Z-Z

END