LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION - PHYSICS

SECOND SEMESTER - APRIL 2022

UPH 2501 - MECHANICS

| Date: 1 | 6-06-2022 | Dept. No. | Max.: 100 Marks |
|-------------|-----------|-----------|-----------------|
| . ^ | | 1 | |

Time: 01:00 PM - 04:00 PM

PART – A

(10x 2 = 20 Marks)

O. No

Answer ALL questions

- 1 State Newton's first law of motion
- 2 What are conservative and non-conservative forces?
- 3 What are the salient properties of simple harmonic motion?
- 4 Write a short note on time dilation.
- 5 What is central force?
- 6 Prove that Kepler's second law is a consequence of conservation of angular momentum.
- 7 Define "center of mass".
- 8 What is small angle approximation?
- 9 A hollow sphere and solid sphere having the same mass are rolling on the inclined plane without slipping. Which one will reach the ground first? Why?
- Write the postulates of special theory of relativity.

PART - B

(4 x7.5 = 30 Marks)

Answer any FOUR questions

- 11 (a) Show that the trajectory of the projectile motion is parabola
 - (b) For what angle of projection, the range is maximum? Show the calculation.
- 12 State and prove (a) perpendicular axis theorem for a plane lamina (b) parallel axis theorem
- 13 (a) Calculate the escape velocity of the particle from the surface of earth.
 - (b) Derive the potential energy expression for two masses separated by finite distance.
- 14 Derive Lorentz transformation equations.
- Derive the expression for time period of compound pendulum.
- 16 Explain in detail length contraction and time dilation.

Part C

Answer any FOUR questions

(4x12.5=50)

- Discuss the motion of a particle of charge 'q', mass 'm' and velocity 'v' in a magnetic field of intensity 'B' if v makes an angle θ with magnetic field B.
- 18 Set up and solve Newton's equation for simple pendulum in two different methods.
- 19 (a) Describe in detail, the analysis of potential energy curve U(x).
 - (b) Set up and solve Newton's equation for Atwood machine problem.
- 20 Describe Michelson-Morley experiment and discuss the implications of the negative result.
- 21 Consider rolling down an incline of an object with a circular periphery and mass distribution symmetric about its center. Find the translational acceleration of rigid body by two different methods.
- Let a particle of Mass m_1 is moving with velocity \vec{v}_1 (along x direction) and another particle of mass m_2 is at rest. The mass m_1 collide with mass m_2 and both the masses stick together and moves with final speed \vec{v} (along x direction). Describe the motion before and after the collision with respect to center of mass frame.

&&&&&&&&&&&