



# Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Mid Term Examination, Fall 2023

Course Code: PHY 101; Course Title: Physics-I: General Mechanics, Waves and Oscillations, Optics and Atom and Modern Physics

Sections & Teachers: (A, B, C, D, E, F): (G, H, I, J);

Shahina Haque (SHA): Md. Suzaudullah (SDH)

Time: 1:30 Hrs

Marks: 25

## Answer ALL Questions

*[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

1.
  - a. Describe what distinguishes the propagation of transverse waves from that of longitudinal waves? [01] CLO-Level-1
  - b. Interpret the practical importance of moment of inertia in our daily experiences. [01]
  - c. If two projectiles are launched with the same initial velocity but at different angles, identify which one will travel the farthest horizontally, and why? [01]
  - d. Check whether the equation  $y = A \sin \omega t + B \cos 2\omega t$  represents a simple harmonic motion or not. [01]
  - e. Compare the distinctions between damping and resonance in their application to waves. [01]
  
2.
  - a. Derive expression for moment of inertia of a circular disc. [3] CLO-Level-2
  - b. Analyze the graph that represents the relationship between force and friction. [3]
  - c. Demonstrate that the total energy of a particle engaged in Simple Harmonic Motion (SHM) remains constant at any given moment. [4]
  
3.
  - a. A particle moves in a circle of radius 10 m. Its linear speed is given by  $v = 3t$ . (i) Predict the centripetal and tangential acceleration at  $t = 2$  s (ii) Calculate the angle between the resultant acceleration and the radius vector. [2.5] CLO-Level-3
  - b. A projectile is launched with an initial speed of 20 m/s at an angle of 30 degrees above the horizontal from a height of 40 meters. Measure: a) The time and range it takes for the projectile to hit the ground. b) velocity of the ball when it reaches the ground [2.5]
  - c. The position of a particle is  $y = 20 \sin(\omega t + \alpha)$ . Time period is 30sec and displacement is 10cm at  $t=0$  Measure (i) epoch (ii) phase at  $t=5$ sec (iii) phase difference between two positions of the particle 15 sec apart. [2.5]
  - d. A plane surface is inclined at an angle of 60degree. A body of mass 10 kg is placed on it. If the value of coefficient of friction  $\mu_k$ , between the body and the inclined surface is 0.2, Find the downward acceleration of the body, along the inclined plane surface. (Take  $g=10\text{ms}^{-2}$ ) [2.5]