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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Mid Term Examination, Spring 2025

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

Sections & Teachers: (A-D, (E-H,Q), I-L, M-P) & (SH, MRI, MOR, JB)

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. **Define** with examples damped vibrations and oscillations. [1.5]

   b. **Draw and describe** a graph that represents the relationship between force and friction. [2] CLO-Level -1

   c. **Define** with real-life examples transverse and longitudinal waves. [1.5]

2. a. Imagine the leaves of a coconut tree swaying in the wind, at the highest bend, they pause for a moment, and in the middle, they move the fastest. Estimate the total energy of the leaves to show that it remains constant at any given moment. [3] CLO-Level -2

   b. Microwave ovens naturally create uneven heating. The microwaves bounce around and form standing waves, creating hot spots where food heats up quickly and cold spots where it doesn't. **Approximate** expression how two traveling waves, like those in a microwave, combine to form a standing wave? [3]

   c. Imagine a camera drone capturing a cricket match, following a curved flight path through the sky just like the trajectory of a cricket ball. Using the basic equations of projectile motion and gravity, **approximate** its peak height and range, confirming that its flight path is a parabola. [4]

3. a. A particle performs simple harmonic motion given by the equation $y = 20\sin[\omega t + \alpha]$. If the time period is 30 seconds and the particle have a displacement of 10 cm at (t = 0), **calculate** (i) epoch; (ii) the phase angle at (t = 5) seconds and (iii) the phase difference between two positions of the particle 15 seconds apart. [3] CLO-Level -3

   b. A Projectile fired horizontally as shown in Fig. a with a speed 98 m/s horizontal from top of a hill of 490m height. **Calculate**: time to reach ground, distance of the target from hill and impact velocity. (g=9.8). [4]

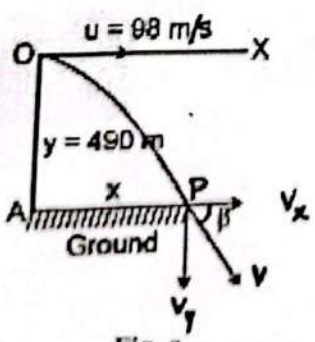


Fig. a

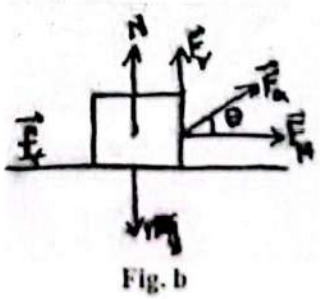


Fig. b

c. A 70 kg box is pulled by 400 N force at an angle 30 deg with horizontal Fig. b. If the coefficient of sliding friction is 0.5, **Calculate** the acceleration of the box [3]