



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. Suzauddulah (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]
 - b. Analyze the graph that represents the relationship between force and friction. [3] CLO-Level-2
 - 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
 - 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 60 degree. A body of mass 10 kg is placed on it. If the value of coefficient of friction μ_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]



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Course Code: PHY 101; Course Title: Physics-I: General Mechanics, Waves and Oscillations, Optics and Atomic and Modern Physics
Sections & Teachers: (A-K) & (SH, SAR)

Time: 1 Hour 30 Mins

Marks: 30

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. List the key concepts related to moment of inertia. [1.5] CLO-1
- b. Draw and describe a graph that represents the relationship between force and friction. [2]
- c. Retrieve how a transverse wave is different from longitudinal waves. [1.5]
- ✓ 2. a. Compute the expression for differential equation of a particle executing SHM [3] CLO-2
- b. Estimate mathematical expression for a standing wave. [3]
- ✓ 3. Approximate the mathematical expressions for different parameters (trajectory, range, maximum height) involved in a projectile motion. [4]
3. A SHM is represented by the equation $y=10\sin(10t-(\pi/6))$. Calculate (i) time period (ii) maximum displacement (iii) maximum velocity and maximum acceleration (iv) displacement, velocity and acceleration at time $t=1\text{ sec}$. [4] CLO-3
4. 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. Compute: (i) The time and range it takes for the projectile to hit the ground. (ii) velocity of the ball when it reaches the ground [3]
- ✓ 5. A particle moves in a circle of radius 10 m. Its linear speed is given by $v = t^2 + 2t$ (i) Compute the centripetal and tangential acceleration at $t = 3\text{ s}$ (ii) Calculate the angle between the resultant acceleration and the radius vector. [3]



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Mid Term Examination, Spring 2025

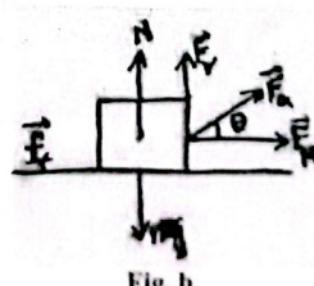
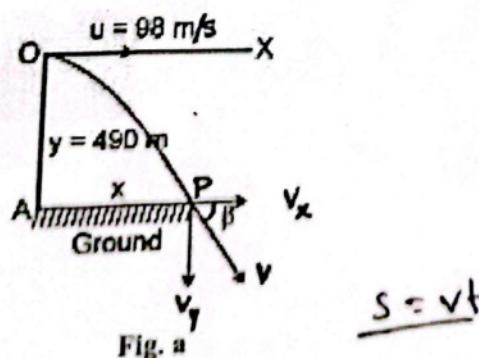
Course Code: PHY 101; Course Title: Physics-I: General Mechanics, Waves and Oscillations, Optics and Atomic and Modern Physics
Sections & Teachers: (A-D, (E-H,Q), I-L, M-P) & (SH, MRI, MOR, JB)

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



4. 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]



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Midterm Examination, Summer 2025

Course Code: PHY 101, Course Title: Physics-I

Level: 1 Term: 2 Section: A-L

Instructor: SH(A-D), AEE(E-H,L), MAM(I,J), JB(K)

Duration: 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 physical significant the terms Center of Mass and Moment of Inertia. [2] CLO-1.
C1
- b. Draw and describe a graph that represents the relationship between force and friction. [2]
- c. Compare the distinctions between damping and resonance in their application to wave. [1]
2. a. Explain mathematically why the trajectory of a projectile launched at an angle follows a parabolic path. Consider the forces acting on the projectile and how they influence its motion. [4] CLO-2.
C2
- b. Describe using mathematical equation that the total energy of a particle engaged in Simple Harmonic Motion (SHM) remains constant at any given moment. [3]
- c. Estimate mathematical expression for a standing wave. [3]
3. a. 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. Compute: a) The time and range it takes for the projectile to hit the ground. b) velocity of the ball when it reaches the ground. [3] CLO-3.
C3
- b. The plane surface is inclined at an angle of 50°. A body of mass 15 kg is placed on it. If the value of coefficient of friction μ_k , between the body and the inclined surface is 0.2, calculate the downward acceleration of the body, along the inclined plane surface. (Take $g=15\text{ms}^{-2}$). [3]
- c. A simple harmonic vibration equation is defined by $Y = 5 \sin (60.832t + \phi)$. The displacement at 0 sec is 2cm. Find (i) the epoch (ii) the frequency and (iii) the maximum velocity. [4]