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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination, Spring 2026

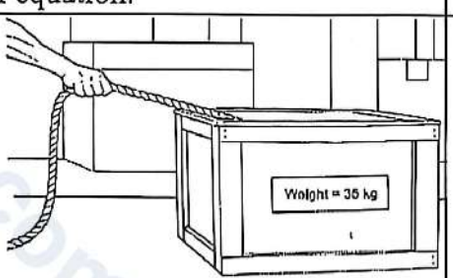
Course Code: PHY101, Course Title: Physics I

Level: 1 Term: 2 Batch: 70

Time: 1.5 Hours (90 Min.) **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)*	Recall the key differences between progressive wave and stationary waves.	1	CO1
	b)	List the characteristics of simple harmonic motion.	1	
	c)	Define the centripetal and centrifugal force.	1	
	d)	Write down the different types of electromagnetic waves.	1	
	e)	State the principle of conservation of linear momentum.	1	
2.	*a)*	A gymnastics bar can be modeled as a thin rod rotating about its centre. Interpret the moment of inertia and radius of gyration of a thin uniform rod about an axis passing through its centre and perpendicular to its length.	3	CO2
	b)	A ball is projected with an initial velocity u at an angle θ with the horizontal. Using the equations of motion, derive expressions for:(i) Time of flight (T) (ii) Maximum height (H) (iii) Horizontal range (R).	3	
	c)	A sound wave propagating in air is modeled as a plane progressive wave. Demonstrate the mathematical expression for a plane progressive wave traveling along the positive x-axis. Explain the physical meaning of each term in the wave equation.	4	
3.	*a)*	A motorcycle starts from rest and accelerates uniformly along a straight road. After traveling a distance of 800 meters, it reaches a speed of 36 m/s. (i) Calculate the acceleration of the motorcycle, (ii) determine the total time it takes to reach this final speed, and (iii) find its speed after it has traveled 500 meters.	2.5	CO3
	b)	A cannon is placed on top of a cliff that is 30 m above the ocean. It is fired horizontally with an initial speed of 1000 m/s. Considering the effects of gravity and assuming no air resistance, (i) determine how long it takes for the cannonball to hit the water. (ii) Calculate the horizontal distance from the base of the cliff where the cannonball lands.	2.5	
	c)	A particle oscillates in simple harmonic motion with the equation: $x = 10\cos(6\pi t + \frac{\pi}{3})$ m, i) Determine the amplitude, time period, and frequency of the motion. ii) Calculate the displacement, velocity, and acceleration of the particle at $t = 3$ s. (iii) Explain the physical meaning of each term in the SHM equation.	2.5	
	d)	A 35 kg box is pull by a 500 N force at an angle of 35° to the horizontal. The box accelerates from rest to a velocity of 4 m/s in 5 seconds. Find the coefficient of friction between the box and the floor. 	2.5	