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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination-Fall 2026

Course Code: PHY101, Course Title: Physics I

Level: 1 Term: 2 Batch: 72

Time: 1.5 Hours **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)*	Identify the significant factors that influence the frictional force of any object.	1	CO1
	b)	List the terms that are required to calculate the two dimensional motion.	1	
	c)	Give the features of the simple harmonic motion.	1	
	d)	Recall the definition of the moment of force and moment of inertia.	1	
	e)	Review the differences between linear momentum and angular momentum.	1	
2.	*a)*	According the Newton's laws of motion, explain the relationship between the net force acting on an object and its acceleration when it's mass remains constant. Present the principle of conservation of linear momentum with the explanation through the collision between the two objects.	3	
	b)	A student performs an experiment in a physics lab using a spring attached to a rigid support which is affected by the restoring force. Why does the work done by the spring? Derive the mathematical expression for that work done.	3	CO2
	c)	(i) Demonstrate that the differential equation of Simple Harmonic Motion can be expressed as, $\frac{d^2x}{dt^2} + \omega^2 x = 0$ Determine the relationship between the angular frequency (ω), spring constant (k) and the mass (m). (ii) Classify various waves according to the requirement of the medium of propagation and direction of propagation.	4	
3.	*a)*	A player kicks the ball toward the opponent's goal with an initial velocity of 40 m/sec, making an angle of 30^0. The goalkeeper is standing 80m away from the player. As soon as the ball is kicked, the goalkeeper starts running toward the ball's landing point with a uniform velocity of 10 m/sec. Calculate the time of flight and horizontal range of the ball. Determine whether the goalkeeper can reach the ball before it touches the ground. Justify your answer mathematically.	2.5	CO3

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	b)	A horizontal force of 400 N acts on a body initially at rest, causing it to reach a velocity of 18 m/s in 10 seconds. If the coefficient of friction between the body and the horizontal surface is 1.25, calculate the mass of the body.	2.5	
	c)	A technician uses a uniform circular metal sheet to investigate its resistance to rotational motion. The sheet has a radius of 0.3 m and mass per unit area $0.1 kg/m^2$ .The technician mounts the sheet on an axis passing through its center and perpendicular to its plane. Determine the total mass and moment of inertia of the sheet about the given axis.	2.5	
	d)	An engineering student is conducting an experiment to investigate the oscillatory motion of a mass attached to a spring in a physics laboratory. The displacement of the mass from its equilibrium position varies with time according to the following equation: $y = 0.5 \sin(50\pi t + 1.5)$, calculate the angular frequency, time period and initial phase of oscillation.	2.5	