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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination, Fall 2025

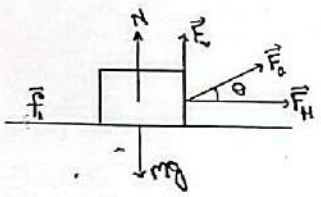
Course Code: PHY101, Course Title: Physics I

Level: 1 Term: 2 Batch: 69

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)*	Can you **recall** the key differences between transverse waves and longitudinal waves?	1	CO1
	b)	**Why** is the Newton's first law of motion called law of inertia.	1	
	c)	**Explain** the physical properties of curl.	1	
	d)	**Write** down the mathematical form of a general ordinary differential equation for SHM and the corresponding form of its general solution.	1	
	e)	**State** the work–energy theorem with mathematical expression.	1	
2.	*a)*	A child rolls a drum-shaped barrel down a hill. **Interpret** the moment of inertia of the barrel about its axis and radius of gyration.	3	CO2
	b)	Standing on a river bridge, a boy throws a stone into the air with some angle to the horizontal. **Explain** how the stone's trajectory is formed by the combined effect of its horizontal motion and gravity.	3	
	c)	**Demonstrate** using mathematical equation that the total energy of a particle engaged in Simple Harmonic Motion (SHM) remains constant at any given moment.	4	
3.	*a)*	**Identify** the divergence $\vec{A} = 4x^2yz\,\hat{\imath} + 3xy^3\,\hat{\jmath} - 2x^2yz^2\,\hat{k}$ at position (2, –1, 1).	2.5	CO3
	b)	During a football match at Daffodil International University, a player from the CSE department kicks the ball with a speed of 28 m/s at an angle of 40° to the horizontal. The ball is aimed toward the goal defended by the Software department team. (a) **How** long will the ball be in the air? (b) **How** far will it travel before hitting the ground? (c) **What** is the maximum height it reaches?	2.5	
	c)	A particle performs simple harmonic motion described by the equation $Y = 12\sin(50t + \phi)$. At time $t = 0$, the particle has a displacement of 8 cm. **Determine** the time period of the motion, the frequency, and the maximum velocity of the particle. Additionally, calculate the phase difference between the positions of the particle at $t = 0$ and $t = 4$ seconds.	2.5	
	d)	A 70 kg box is pulled by 400 N force at an angle 30 deg with horizontal. If the coefficient of sliding friction is 0.5, **solve** the acceleration of the box. 	2.5	