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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering
Midterm Examination-summer 2026
Course Code: PHY101, Course Title: Physics I
Level: 1 Term: 2 Batch: 71

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 definition of inertia and force that influence the motion of any object.	1	CO1
	b)	Present the significant meaning of coefficient of friction for static and kinetic friction	1	
	c)	Explain the Hooke's law for a spiral spring.	1	
	d)	Define damped vibration with figure.	1	
	e)	Write down the principle of conservation of linear momentum.	1	
2.	*a)*	A university student is conducting an experiment to study the motion of a missile launched from a projectile launcher. The missile is projected from ground level with an initial velocity V_0 at an angle θ to the horizontal. Derive an expression for the horizontal displacement and vertical displacement of the projectile along with the equation of motion of the trajectory of the projectile.	4	
	b)	A cyclist is participating in a road race and approaches a curved section of the track with radius r. To avoid slipping while maintaining a constant speed v, the cyclist naturally leans inward toward the center of the curve, making an angle θ with the vertical. Prove that the general equation for the banking angle of a cyclist is $\tan\theta = \frac{v^2}{rg}$	2	CO
	c)	A small block of mass m is attached to a spring of force constant k and placed on a frictionless horizontal surface. The block is displaced a distance from its equilibrium position and released. The block then executes simple harmonic motion (SHM). Show that the sum of the kinetic and potential energies as a function of displacement remains constant throughout the motion.	4	
3.	*a)*	During a soccer training session, a player wants to kick a ball over a defender and into a small target mounted on a practice wall. The target is located 30 m away from the player and is 1.8 m above the ground. The player kicks the ball at an angle of 35^0 to the horizontal. (i) What must be the initial velocity of the ball so that it strikes the target? (ii) How long does it take for the ball to reach the target?	2.5	CO
	b)	During a flood relief operation in a remote area of Bangladesh, a helicopter is flying horizontally at a constant speed of 50 m/s at an altitude of 120 m above the ground. To deliver emergency supplies, the crew releases a supply bag from the helicopter without	2.5	

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	giving it any additional push. Ignoring air resistance, calculate the resultant velocity of the bag just before it reaches the ground.	
c)	In a physics laboratory, a student investigates the oscillatory motion of a mass attached to a vertical spring that suspends a 50 g mass from the spring and gently pulls it downward by 10 cm before releasing it. The mass then executes simple harmonic motion (SHM). Using a stopwatch, the student measures the time required for one complete oscillation is 1 second. What is the angular frequency, frequency of the oscillations and spring constant of the spring?	**2.5**
d)	In a warehouse, a worker needs to move a heavy crate across a rough concrete floor. The crate has a mass of 60 kg. To move it, the worker applies a force of 600 N using a handle that is inclined at 45° above the horizontal. The coefficient of kinetic (sliding) friction between the crate and the floor is 0.40. Determine the acceleration of the crate.	**2.5**