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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Mid Term Examination, Fall 2026

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

Sections & Teachers: SH(A-D), KI(E-F), RH(G-J) & BB(K-N)

Time: 1 Hour 30 Mins **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.	In a computer lab, a technician pushes a heavy server rack across the floor. **Draw and describe** a graph that represents the relationship between applied force and friction.	[2.5]	CO-1, C1
	b.	In a robotics project, students observe waves travelling through air alom a stretched string. **Identify and describe** the basic differences between longitudinal and transverse waves with suitable examples and figures.	[2.5]	
2.	a.	During a vibration test of a cable in a student project, two identical progressive waves of amplitude A, angular frequency ω and wavelength λ travel in opposite directions along the same cable. **Estimate** the equation of the resulting standing wave and **compute** the conditions for the positions of nodes and antinodes.	[5]	CO-2, C2
	b.	A group of SWE students is preparing a projectile-motion simulation for a game. **Approximate** the expressions for different parameters (trajectory, range, maximum height) involved in projectile motion. **Predict** the launch angle for which the maximum height of a projectile is equal to its horizontal range.	[5]	
3.	a.	In a game physics simulation, a ball is thrown from the ground with a speed of 30 m/s at an angle of 45° above the horizontal. Take $g = 9.8$ m/s^2 and neglect air resistance. **Calculate:** (i) The time at which the ball reach 10 m, once going up and once coming down? (ii) The speed of the ball at each of the two points? (iii) The direction of the velocity at each point, measured from the horizontal? (iv) The horizontal distance between the two points?	[5]	CO-3, C3
	b.	During a robotics lab test, a block of mass $m = 200$ g moving with a speed $v = 20$ m/s collides inelastically with a block of mass $M = 500$ g, initially at rest, that is attached to a spring of spring constant $k = 280$ N/m. The other end of the spring is fixed to a wall. Ignore friction. **Calculate:** (i) The speed of the system of the two blocks after the collision (ii) The amplitude of oscillation of the two blocks. (iii) The time period and the total energy of the oscillating system.	[5]	