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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Summer–2026

Course Code: 0533-111 | Course Title: Physics | Teacher's Initial: SAT, MMR

Section: A, B, C, D, E, F | Level-Term: L1-T1 | Time: 2 Hours

Full Marks: 40 | Exam Date: 22 August 2026

Note: There are three sets of questions in total. Answer all of them. Right hand margin indicates full marks.

Q1. (a) **Describe** sharpness of resonance. **CO-1 (C2)** **[2]**

(b) **Differentiate** between wave and oscillation. **CO-1 (C2)** **[3]**

Q2. (a) **Express** the general differential equation of progressive wave motion. **CO-3 (C2)** **[3]**

(b) **Show** that simple harmonic motion average potential energy is half of the total mechanical energy for a complete cycle. **CO-3 (C2)** **[4]**

(c) **Estimate** the velocity of sound in air using Laplace's correction. **CO-3 (C2)** **[4]**

(d) **Describe** the shape of the Lissajous figure formed when the frequency ratio of the two oscillations is 1:1. Explain how the phase difference between the two oscillations affects the shape. **CO-3 (C2)** **[4]**

Q3. (a) The sound intensity level of a machine is 100 dB at a distance of 5 m. At what distance from the machine will the intensity level decrease to 80 dB? **CO-2 (C3)** **[4]**

(b) A progressive wave has the equation $y(x,t)=0.04\sin[2\pi(40t-4x)]$. **Calculate** the amplitude, wavelength, frequency, wave velocity, angular frequency, and time period. **CO-2 (C3)** **[4]**

(c) For damped oscillator mass of object 0.35 kg, spring constant $K=87\ Nm^{-1}$ and damping constant $b=0.07\ kgs^{-1}$. , **Calculate** after how many complete oscillations does the amplitude become half of its initial value? **CO-2 (C3)** **[4]**

(d) A police car is approaching a stationary observer at 90 kmh^{-1} while its siren emits a sound of frequency 750 s^{-1}. If the speed of sound is 340 ms^{-1}, **Calculate** the frequency does the observer hear? Also the frequency will be heard after the police car passes the observer? **CO-2 (C3)** **[4]**

(e) A sinusoidal wave of amplitude 10 cm travels along the positive -axis. At a particular instant, the displacement of a particle 20 cm from the origin is +5 cm, while that of another particle 50 cm from the origin is −5 cm. **Calculate** the wavelength of the wave. **CO-2 (C3)** **[4]**