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Daffodil International University

Faculty of Engineering

Final Examination, Spring 2025

Course Code: 0533-111 | Course Title: Physics
Section: A,B,C,D,E | Level-Term: L1-T1 | Teacher's Initial: SAT
Full Marks: 40 | Exam Date: June 24, 2025 | Time: 2 Hours

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

Q1. (a) **Explain** the formation of Newton's rings. CO-1 (C2) [2]

(b) **Explain** Quality factor and sharpness of resonance. CO-1 (C2) [2]

Q2. (a) In newton's ring experiment the diameter of 12th dark ring is 1.8 cm and it is changed by 0.43 cm when a liquid is introduced between lens and the plate. **Calculate** the difference between diameters of 15th dark ring for air and liquid. CO-2 (C3) [4]

(b) For the damped oscillator m = 250 g, k = 85 Nm^{-1}, and b = 70 gs^{-1}. **Calculate** after how many periods will the mechanical energy be half of the initial energy? CO-2 (C3) [4]

(c) A block has mass m = 2.72 × 10^5 kg and is designed to oscillate at frequency f =10.0 Hz and with amplitude x_m = 20.0 cm. **Calculate** the the block's speed as it passes through the point 7cm away from the equilibrium position and also **compute** the kinetic energy and potential energy of the system at that point. CO-2 (C3) [4]

(d) Light containing two wavelengths λ_1 and λ_2 fall normally on the convex lens of radius of curvature R, resting on a glass plate. Now nth dark ring of λ_1 coincides with (n+1) th dark ring of λ_2. Then prove that radius of nth dark ring due to λ_2 is $\sqrt{\frac{\lambda_2^2 R}{\lambda 1 - \lambda 2}}$. CO-2 (C3) [4]

(e) **Explain** the occurrence of damped oscillations in an LCR circuit and support your explanation with the appropriate differential equation. CO-2 (C2) [4]

(f) **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-2 (C2) [4]

(g) **Show** that for Simple harmonic motion average potential energy and kinetic energy are half of the total mechanical energy. CO-2 (C2) [4]

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Q3. (a) When a simple harmonic wave is propagated through a medium, the displacement of a particle (in m) at any instant of time is given by $y(x,t)= 0.08\sin(120\pi t-4\pi x)$. **Calculate** the amplitude of the vibrating particle, wave velocity, wavelength, frequency, angular frequency and time period. CO-3 (C3) [

(b) **Show** that the distance between two successive nodes and antinodes are same in a standing wave formed on a string. CO-3 (C3) [4]

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