Daffodil International University

Faculty of Engineering

Final Examination, ~~Fall~~ Spring 2025

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

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

Full Marks: 40 | Exam Date:27 April, 2026

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

Q1. (a) **Explain** the conditions necessary for the interference of light to occur.	CO-1 (C2)	[2]
(b) **Explain** quality factor and sharpness of resonance.	CO-1 (C2)	[2]
Q2. (a) **Apply** the principle of interference to derive the expression for the diameter of the m-th dark ring in Newton's Rings experiment, and hence obtain the formula used to determine the wavelength of monochromatic light.	CO-2 (C3)	[4]
(b) 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 **derive** that diameter of nth dark ring due to λ_2 is	CO-2 (C3)	[4]
(c) A block has mass $m = 2.72 \times 10^5$ 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) For the damped oscillator m = 264 g, k = 85 Nm^{-1}, and b = 80 gs^{-1}. **Calculate** after how many complete oscillation will the mechanical energy be half of the initial energy?	CO-2 (C3)	[4]
(e) 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 $Y(x,t)=0.04\sin[8\pi(25t+2x)]$. **Calculate** the amplitude of the vibrating particle, wave velocity, wavelength, frequency, angular frequency and time period.	CO-2 (C3)	[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) In a double slit experiment using sodium light of wavelength 5.89×10^{-5} cm an interference pattern is obtained in which 30 equally spaced fringes occupied a distance of 3 cm on a screen. On replacing the sodium lamp with another monochromatic light source but making no other changes, 20 bright fringes are	CO-2 (C3)	[4]

found to occupy a distance of 2.4 cm, on the screen. **Calculate** the frequency of the light.

Q3. (a) **Explain** the occurrence of damped oscillations in an LCR circuit and support your explanation with the appropriate differential equation. CO-3 (C2) [4]

(b) **Show** that the distance between two successive nodes and antinodes are same in a standing wave formed on a string. CO-3 (C2) [4]