



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Fall-2025

Course Code: 0533-111
Section: A,B,C,D,E,F,G,H
Full Marks: 25

Course Title: Physics
Level-Term: L1-T1
Exam Date: 18 October 2025

Teacher's Initial: SAT, MMR
Time: 1.5 Hours

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

- Q1.** (a) Explain how Young's double slit experiment demonstrates the concept of wave-particle duality. CO-1 [2]
(C2)
- (b) Distinguish between isothermal process and adiabatic process. CO-1 [2]
(C2)
- Q2.** (a) Derive the relation $C_p = C_v + R$ for an ideal gas, where C_p and C_v are the molar specific heats at constant pressure and constant volume, respectively, and R is the universal gas constant. CO-2 [4]
(C3)
- (b) Show that, in Young's double-slit experiment, the distance between two consecutive bright fringes is equal to the distance between two consecutive dark fringes. CO-2 [4]
(C3)
- Q3.** (a) A Carnot engine has 60% efficiency when the source temperature is 50°C . Calculate the decrease in temperature of the heat sink to make its efficiency 75%. CO-2 [3]
(C3)
- (b) A plano-convex lens of radius of curvature $R = 1.0\text{ m}$ is placed on a flat glass plate, and illuminated with monochromatic light of wavelength $\lambda = 600\text{ nm}$. Find the radius of the 5th dark ring observed in reflected light. If the diameter of the 10th bright ring is measured as 5.22 mm , calculate the wavelength of the light used. CO-2 [3]
(C3)
- (c) A monoatomic ideal gas ($\gamma = \frac{5}{3}$) undergoes a reversible adiabatic expansion. Initially, the gas has a pressure $P_1 = 1.00\text{ atm}$ and a volume $V_1 = 10.0\text{ L}$. It expands to a final volume $V_2 = 20.0\text{ L}$. Calculate the final pressure P_2 and the work done by the gas (in joules). CO-2 [4]
(C3)
- (d) In a Young's double-slit experiment, two slits are separated by a distance of 0.5 mm . The screen is placed 1.5 m away from the slits. If monochromatic light of wavelength 600 nm is used and the screen is 0.1 m tall. Calculate how many dark fringes will appear within this screen height? CO-2 [3]
(C3)