

Subjective Part

(To be solved on Answer Books only)

Subject: Applied Physics
Class: BSCYS-II
Section(s): A, B
Course Code: PHY-111

Time Allowed: 3 Hours
Max Marks: 100
FM's Name: Shamaila Fatima
FM's Signature: _____

INSTRUCTIONS

- Attempt responses on the answer book only.
- Nothing is to be written on the question paper.
- Rough work or writing on question paper will be considered as use of unfair means.
- Tables / calculators are allowed / not allowed.

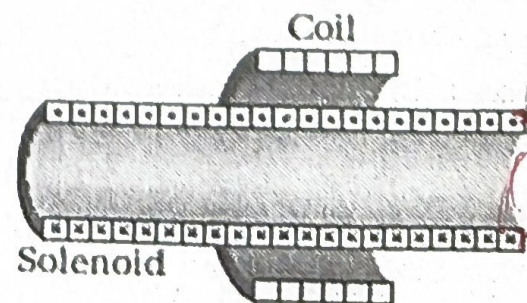
Q1. C2, GA2 (40 Marks)

- a) State and **explain** young double slit experiment. Derive the expression for constructive and destructive interference. (6+4+4) 14
- b) (i) State Ampere's law. Interpret and **Derive** the expression for Ampere's law.
(ii) **Determine** the magnetic field outside, inside and on the axis of the long current carrying toroid. (6+7) 13
- c) (i) What is Hall Effect? **Explain** briefly.
(ii) **Show** that the number density n of free electrons in a conductor wire is given in terms of the Hall electric field strength E and the current density J : $n = J/(BeE)$ (Here we have $J = i/A$; where i is the electric current intensity, and A is the cross-sectional area of the wire). Also calculate the Hall Voltage. (5+8) 13

Q2. C3, GA3 (12*5 = 60 Marks)

Solve all the scenarios given below with understanding.

- a) A potential difference of 3.00 nV is set up across a 2.00 cm length of copper wire that has a radius of 2.00 mm. How much charge drifts through a cross section in 3.00 ms?
- b) In Fig., a 120 turn coil of radius 1.8 cm and resistance 5.3 Ω is coaxial with a solenoid of 220 turns/cm and diameter 3.2 cm. The solenoid current drops from 1.5 A to zero in time interval $\Delta t = 25$ ms. What current is induced in the coil during Δt ?



(c) At what rate must the potential difference between the plates of a parallel-plate capacitor with a 2.0 mF capacitance be changed to produce a displacement current of 1.5 A?

(d) In a double-slit arrangement the slits are separated by a distance equal to 100 times the wavelength of the light passing through the slits. (a) What is the angular separation in radians between the central maximum and an adjacent maximum? (b) What is the distance between these maxima on a screen 50.0 cm from the slits?

(e) In Fig., light is incident at angle $\theta_1 = 40.1^\circ$ on a boundary between two transparent materials. Some of the light travels down through the next three layers of transparent materials, while some of it reflects upward and then escapes into the air. If $n_1 = 1.30$, $n_2 = 1.40$, $n_3 = 1.32$, and $n_4 = 1.45$, what is the value of (a) θ_5 in the air and (b) θ_4 in the bottom material?

