

**International Islamic University Chittagong**  
**Department of Electrical and Electronic Engineering**

B.Sc. Engineering in EEE

Midterm Examination, Spring 2024

Course Code: **PHY-1201**

Course Title: **Physics II**

Time: 1 hour 30 minutes

Full Marks: 30

(i) Answer all the questions. The figures in the right-hand margin indicate full marks.

(ii) Course Outcomes (COs) and Bloom's Levels (BL) are mentioned in additional Columns.

CO	CO Statements
CO1	Understand the basic knowledge of electromagnetism, structure of matter and modern physics in the context of engineering.
CO2	Apply mathematical knowledge of electromagnetism, structure of matter and modern physics to formulate and solve basic engineering problems.

Bloom's Levels (BL) of the Questions						
Letter Symbols	C1	C2	C3	C4	C5	C6
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

- 1) a) Explain electric field and electric potential. Develop the relation the electric field and dipole moment at a distance with perpendicular bisector. CO1 C2 5+2
- 1) b) Calculate the field E due to a dipole moment  $4.5 \times 10^{-12}$  c/m at a distance 15 m from it on the perpendicular bisector. CO2 C3 3

**OR**

- 1) a) State and explain Gauss's law. Taking potential as the line integral of the electric field, Deduce an expression for the potential at a point in the electric field due to (a) a point charge, (b) a group of point charges. CO1 C2 5+2
- 1) b) An electric dipole moment  $2 \times 10^{-8}$  Cm is placed in a uniform magnetic field of intensity  $1.5 \times 10^5$  NC<sup>-1</sup>. CO2 C3 3
- (i) What maximum torque does the field exert on the dipole?
- (ii) How much work is done on turning the dipole end to end?
- 2) a) Explain the terms Lorentz force and Ampere's law? Derive the relation between the magnetic induction and current at a straight conductor carrying current. CO1 C2 5+2
- 2) b) A solenoid has a mean diameter of 0.05 m and of length 2 meters. It has 4 layers of 1000 turns each. Calculate the flux density at its center when a current of 2.5 A flows through it. Also calculate the magnetic flux at its center. CO2 C3 3

- 3) a) Define mutual inductance between a pair of coils. Deduce an expression for the mutual inductance of a pair of coaxial solenoids with the shorter solenoid wound over the middle of longer one. CO1 C2 5+2
- 3) b) A solenoid of length 30 cm and area of cross section  $10 \text{ cm}^2$  has 3000 turns wound over a core of constant permeability  $60 \times \mu_0$ . Another coil of 500 turns is wound over the same coil at its middle. Calculate the mutual inductance between them. [ The value of  $\mu_0$  is last two digit of your ID] CO2 C3 3