

International Islamic University Chittagong
Department of Electrical and Electronic Engineering
B.Sc. Engineering in EEE
Midterm Examination, Spring 2025.

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.

Course Outcomes (COs), Program Outcomes (POs) and Bloom's Levels (BL) of the Questions		
CO	CO Statements	PO
CO1	Understand the basic knowledge of electromagnetism, structure of matter and modern physics in the context of engineering.	POb
CO2	Apply mathematical knowledge of electromagnetism, structure of matter and modern physics to formulate and solve basic engineering problems.	POa
CO3	Evaluating the physics knowledge that use in EEE engineering professional.	POa

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 between the electric field and dipole moment at a distance with the perpendicular bisector. CO1 C1 2+5
C3
- 1) b) Calculate the electric field E produced by a dipole moment of 4.5×10^{12} C/m at a distance of 15 m from it along the perpendicular bisector. CO2 C5 3

OR

- 1) a) State and explain Gauss's law. By considering the potential as the line integral of the electric field, derive an expression for the potential at a specific point in the electric field caused by (a) a point charge and (b) a collection of point charges. CO1 C1 2+5
C3
- 1) b) Find the potential at the center of a 1.0 m square having charges q, -2q, 3q and 2q at its corners. ($q = 1.0 \times 10^{-8}$ C). CO2 C5 3
- 2) a) State and explain Ampere's circuital law. Using Ampere's law, determine the magnetic field inside a long solenoid and write the application of a solenoid. CO1 C1 2+5
C5

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|-------|--|-----|----------|-----|
| 2) b) | A solenoid with 1200 turns is uniformly wound in a single layer around a glass tube that is 2 meters long and 0.2 meters in diameter. Calculate the magnetic induction at the centre of the solenoid when a current of 2 A flows through it. | CO2 | C5 | 3 |
| 3) a) | Compare self-inductance and mutual inductance. Derive an expression for the self-inductance of a long solenoid wire. | CO1 | C1
C3 | 2+5 |
| 3) b) | Two coils, a primary of 600 turns and a secondary of 30 turns, are wound on an iron ring of mean radius 0.1 m and cross-section 4×10^{-2} m diameter. Find their mutual inductance (μ_r for iron = 800). | CO2 | C5 | 3 |

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- | | | | |
|---|-----|----|-----|
| 1) a) Explain the electrical potential difference and dipole? Prove the Coulomb's law from the Gauss's law? | CO1 | C2 | 2+5 |
| 1) b) Two charges +q and -3q are separated by a distance of 1 m. At what points on its axis is the potential zero? | CO2 | C3 | 3 |
| OR | | | |
| 1) a) Compare between insulator and dielectric materials. 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 | 2+5 |
| 1) b) What is the potential at the surface of an aluminum nucleus $r = 4.5 \times 10^{-13}$ cm and its charge $q = 13e$? | CO2 | C3 | 3 |
| 2) a) Explain the terms Lorentz force and Ampere's law? Derive the relation between the magnetic induction and current at a circular coil carrying current. | CO1 | C2 | 2+5 |
| 2) b) Determine the magnetic force on a wire 1 m long and carrying a current 10 A when placed in a uniform field of magnetic induction 1.5 Wbm^{-2} making an angle of 30° with the direction of the field. | CO2 | C3 | 3 |
| 3) a) Distinguish between self-induction and mutual induction. 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 | 2+5 |
| 3) b) Calculate the self inductance of a solenoid having 1000 turns and length 1m. The area of cross section 7 cm^2 and relative permeability of the core is 1000. | CO2 | C3 | 3 |