

# International Islamic University Chittagong (IIUC)

## Department of Electronic and Telecommunication Engineering

### Final Examination

Program: **B.sc (Engg.)**  
 Course Code: **PHY-1201**  
 Total Marks: **50**

Semester: **Spring 2023**  
 Course Title: **Physics - II**  
 Time: **2 Hours 30 Minutes**

|   |  |            |           |           |          |          |
|---|--|------------|-----------|-----------|----------|----------|
| <b>(i) Answer all the questions. The figures in the right-hand margin indicate full marks.</b><br><b>(ii) Course Outcomes (COs) and Bloom's Levels are mentioned in additional Columns.</b> |  |            |           |           |          |          |
| <b>Course Outcomes (COs) of the Questions</b>   |  |            |           |           |          |          |
| <b>CLO1</b>   | Demonstrate an understanding of Electricity; Magnetism, Alternating Current, Solid state physics, Modern Physics; Relativity.  |            |           |           |          |          |
| <b>CLO2</b>   | Apply basic physics laws and formulae to complex cases like; Gauss's law for dielectric material, Biot-Savart law for solenoid, toroid, Ampere's law, Faraday's laws, Crystal lattice formation for solid state electronic materials, Photo-electric and Compton effect etc. |            |           |           |          |          |
| <b>Bloom's Levels of the Questions</b>  |  |            |           |           |          |          |
| <b>Letter Symbols</b>   | <b>R</b>   | <b>U</b>   | <b>Ap</b> | <b>An</b> | <b>E</b> | <b>C</b> |
| <b>Meaning</b>  | Remember   | Understand | Apply     | Analyse   | Evaluate | Create   |

| PART A |    |   |      |    |     |  |
|--------|----|---|------|----|-----|--|
| Q1.    | a) | Compose your idea on "electric current".  | CLO1 | U  | 1.5 |  |
|        | b) | Derive the expression $J = n e v_D$ , where the symbols have their usual meaning.   | CLO1 | An | 6   |  |
|        | c) | A copper wire of diameter 0.5 mm and length 15 mm is connected across a battery of emf 1.5 V and internal resistance 1.15 $\Omega$ . Estimate the current density, $J$ in the wire. | CLO2 | Ap | 2.5 |  |
| OR     |    |   |      |    |     |  |
| Q1.    | a) | Illustrate your idea on "peak value" in case of AC.   | CLO1 | U  | 2   |  |
|        | b) | Prove that $I_{rms} = 0.707 I_0$ , where the symbols hold meaning in case of alternating current.   | CLO1 | An | 6   |  |
|        | c) | Form factor of alternating current is kept 1.11. If the mean value of current is 1.53 Amp, estimate the r.m.s value.  | CLO2 | Ap | 2   |  |
| Q2.    | a) | Illustrate crystal structure with example.  | CLO1 | U  | 2   |  |
|        | b) | Explain fcc lattice with example.   | CLO2 | U  | 6   |  |
|        | c) | Sketch the crystal structure of sodium chloride and show the lattice points.  | CLO2 | An | 2   |  |
| PART B |    |   |      |    |     |  |
| Q3.    | a) | Illustrate your idea on inertial and non-inertial frames.   | CLO1 | U  | 2   |  |
|        | b) | Derive the relation $L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$ , where the symbols have their usual meanings.   | CLO1 | An | 6   |  |
|        | c) | If a rigid body of rest mass 2kg is moving at a constant velocity $2.5 \times 10^7 \text{ ms}^{-1}$ , determine the relativistic mass.  | CLO2 | Ap | 2   |  |
| Q4.    | a) | What do you understand by mass defect? Explain with an example.   | CLO1 | U  | 3   |  |
|        | b) | Mention the postulates of Bohr atomic model.  | CLO1 | U  | 4   |  |

|           |    |   |      |             |     |
|-----------|----|---|------|-------------|-----|
|           | c) | Estimate the nuclear density of $C^{14}$ atom.  | CLO2 | Ap          | 3   |
| <b>OR</b> |    |   |      |             |     |
| Q4.       | a) | Explain the term; De-Broglie waves and photo electric effect? According to the fundamental postulates of Bohr's atom model, construct an expression for the total energy level equation of hydrogen atom. | CLO1 | U<br>+<br>E | 2+5 |
|           | b) | The photoelectric surface has a work function of 4 eV. What is the maximum velocity of the photoelectrons emitted by light of frequency 1015 hertz incident on the surface?                               | CLO2 | An          | 3   |
| Q5.       | a) | Explain radioactive disintegration with an example.   | CLO1 | U           | 1   |
|           | b) | State the radioactive disintegration laws and prove that $N = N_0 e^{-\lambda t}$ , where the symbols have their usual meaning.   | CLO2 | An          | 2+4 |
|           | c) | The half-life of radon is 70 days, calculate decay constant and mean life of radon?   | CLO2 | Ap          | 3   |