



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

Course Code: 0713-215
Section: A, B, C
Full Marks: 25

Course Title: Electrical Properties of Materials
Level-Term: L2-T1
Exam Date: March 17, 2025
Teacher's Initial: SH, AKB
Time: 1.5 Hours

Answer all the questions

- Q1. Explain the followings shortly-**
- a) Bravais Lattice.
 - b) Allotropes.
 - c) Current Density.
 - d) Drift Velocity.
- Q2. Consider the FCC unit cell of the copper crystal shown in the Fig. 1:**
- a) Find the number of atoms per unit cell.
 - b) Find Atomic Packing Factor.
 - c) Find the atomic concentration in Cu and the density of copper crystal given that the radius of Cu is 0.128 nm and atomic mass of copper is 63.5 gmol^{-1} .
- Q3. A unit cell is shown in the Fig. 2:**
Cell parameter, $a = 0.362 \text{ nm}$
- a) Find the planar concentration for plane (100).
 - b) Find the planar concentration for plane (111).
- Q4. For a given crystal in the Fig. 3:**
Show/ Draw the family of directions: $\langle 111 \rangle$.
- Q5. a) Deduce the expression of the electrical conductivity, $\sigma = en\mu_d$, for a solid using the classical free electron theory (Drude model).**
- b) Find the drift mobility and the mean scattering time of conduction electrons in copper at room temperature, given that the conductivity of copper is $5.9 \times 10^5 \Omega^{-1} \text{ cm}^{-1}$. The density of copper is 8.96 g cm^{-3} and its atomic mass is 63.5 g mol^{-1} .**

CO-1 4
C(2)

CO-1 6
C(2)

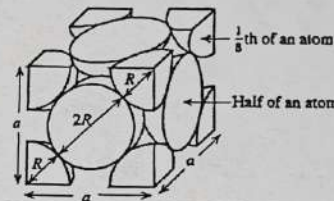


Fig. 1

CO-1 4
C(2)

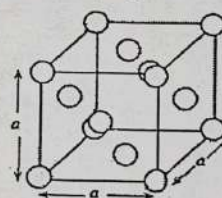


Fig. 2

CO-1 3
C(2)

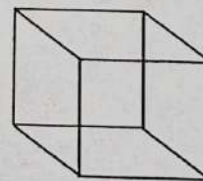


Fig. 3

CO-3 5
C(4)

CO-3 3
C(3)