Jashore University of Science and Technology

Bachelor of Science in Electrical and Electronic Engineering

1st semester of 3rd year, Session: 2022–2023

Course no.: PHY 3101 **Course title: Electrical Engineering Materials**

Assignment no.: 01 **Date: 04 November 2025**

Last date of submission: 20 November 2025 at 12:30 PM

Answer any five questions of the followings:

1. Define conductivity. Show that the current density J_x if given by $J_x = en\mu_d E_x$.

2. Write a short note on Hall effect. Discuss how the Hall effect could be used to obtain information on free charge density in a conductor. (Hint: Consider how drift velocity and current are related.)

3. What is energy band? Explain how energy bands are formed. Define semiconductor in terms of energy band.

4. Define density of states. Drive an expression to calculate the energy density of states.

5. Write down the mathematical expression of Fermi–Dirac distribution function. Explain its significance in details with proper sketch.

6. What are dielectric materials? Show that $\varepsilon_r = 1 + \dfrac{N\alpha_e}{\varepsilon_0}$.

7. Write short notes on (a) orientational polarization and (b) interfacial polarization.

8. Define magnetization and magnetic field intensity. Show that $\mu_r = 1 + \chi_m$.

9. How magnetic materials are classified? Explain the properties of each type with example.

10. What is superconductivity and Meissner effect. Write a short note on type II superconductors.