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CSE 2A144
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Question Paper Code : 12041

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Second Semester

Computer Science and Engineering

PH3256 – PHYSICS FOR INFORMATION SCIENCE

(Common to : Computer Science and Design/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer Science and Engineering (Cyber Security)/Computer Science and Engineering (Data Science)/Computer and Communication Engineering/Artificial Intelligence and Data Science/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the drift velocity of the free electron with a mobility of $3.5 \times 10^{-3} \text{ m}^2 \text{ V}^{-1} \text{ S}^{-1}$ in copper for an electric field strength of 0.5 V/m.
2. Define drift velocity.
3. What are the charge carriers in a semiconductor?
4. Define doping.
5. What are the types of energy involved in domain theory?
6. Define hysteresis in magnetic materials.
7. What are excitons?
8. How can population inversion be achieved for laser?
9. What are nanomaterials?
10. Why does coulomb blockade occur only at very small capacitances?

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Deduce an expression for electrical conductivity of a conducting material by using classical free electron theory and list out its merits and demerits. (10)
- (ii) Write down the expression for thermal conductivity and hence deduce the Wiedemann-Franz law. (6)

Or

- (b) (i) Write the expression for Fermi Dirac distribution function $F(E)$ and discuss the effect of temperature on Fermi function with neat diagrams. (10)
- (ii) Briefly explain the formation of energy bands in solids. (6)
12. (a) Deduce an expression for density of electrons in a conduction band of an intrinsic semiconductor. Write down the expression for density of holes in valence band and hence deduce the expression for intrinsic carrier concentration.

Or

- (b) What is Hall effect? Obtain an expression for the Hall co-efficient of n-type and p-type semiconductor Give the applications of Hall effect.
13. (a) How magnetic materials are classified based on magnetic moments? Compare their properties and characteristic with examples.

Or

- (b) Explain ferromagnetic domain theory. Briefly explain different types of energy involved in domain growth.
14. (a) Derive the expression for photocurrent in a PN junction diode when it is exposed to light.

Or

- (b) Explain the principle of operation of a solar cell. How does the photovoltaic effect lead to current generation?
15. (a) Compare the quantum confinement and explain the resulting structures and their physical significance.

Or

- (b) (i) Write the general form of a single-qubit pure state and show how it can be represented on the Bloch sphere. (12)
- (ii) What are the advantages of quantum computing over classical computing? (4)