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Question Paper Code : 82032

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Second Semester

Electronics and Communication Engineering

PH 3254 — PHYSICS FOR ELECTRONICS ENGINEERING

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define space lattice.
2. Write the relation between the atomic radius and lattice parameter for a FCC crystal.
3. Calculate the drift velocity of the free electrons in copper which have a mobility of $3.5 \times 10^{-3} \text{ m}^2\text{V}^{-1}\text{s}^{-1}$ for an electric field of 0.5 V/m.
4. What is the principle behind GMR devices?
5. Differentiate between intrinsic and extrinsic semiconductors.
6. Draw an energy band diagram for an ohmic contact between a metal and a semiconductor before and after contact.
7. Classify optical materials based on their interaction with light.
8. Name one type of optical modulator and mention its application.
9. What is meant by quantum confinement?
10. Mention the advantage of using quantum wells in lasers.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Describe the structure of a simple cubic crystal (SC) system and body centred cubic (BCC) system. Also calculate the atomic packing factor (APF) of simple cubic crystal system and body centred cubic (BCC) system.

Or

- (b) (i) Derive an expression for the interplaner spacing for (hkl) planes of a cubic structure. (8)
(ii) What are crystal imperfections? Explain the point and line defects with necessary illustration. (8)
12. (a) Mention the merits of classical free electron theory. Based on that deduce the mathematical expression for electrical conductivity and thermal conductivity of a conducting material.

Or

- (b) (i) Explain the classification of magnetic materials as dia, para, and ferromagnetic materials. (12)
(ii) Magnetic material has magnetization of 2300 A/m and produces a flux density of 0.00314 wb/m². Calculate magnetizing force and relative permeability of the material. (4)
13. (a) Derive an expression for density of electrons in the conduction band and density of holes in the valence band of an intrinsic semiconductor.

Or

- (b) (i) What is the Hall effect in semiconductors? Derive an expression of Hall coefficient. (8)
(ii) Describe the construction and working of Schottky diode. (8)
14. (a) Describe the various optical processes in semiconductors including optical absorption, emission, charge injection, and recombination. Explain the concepts of optical loss and optical gain in detail.

Or

- (b) (i) With a diagram, describe the components and operation of a Light Emitting Diode (LED). (8)
(ii) Explain the operation of a laser diode and its uses. (8)
15. (a) Discuss the density of states in quantum well, quantum wire and quantum dot structures.

Or

- (b) (i) Describe the construction and working of single electron transistor with neat diagram. (8)
(ii) What are carbon nanotubes? List out the properties and applications of carbon nanotubes. (8)