Reg. No. :

Question Paper Code : 21442

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Second Semester

Electrical and Electronics Engineering

PH 3202 — PHYSICS FOR ELECTRICAL ENGINEERING

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Dipole moment and Polarization phenomenon.

2. Give examples of capacitor materials.

3. Give the expression for thermal conductivity of a solid.

4. Explain the concept of holes in semiconductors.

5. Draw the Energy band diagram of indirect band gap semiconductors.

6. Illustrate the Hall effect in a P-type semiconductor bar with diagram.

7. Explain the optical process in quantum wells.

8. Name any two non-linear optical phenomena.

9. What is quantum confinement?

10. Explain quantum resistance and conductance.

PART B — (5 × 16 = 80 marks)

11. (a) Derive expressions for Electronic Polarization and Ionic Polarization in a dielectric material.   (16)

Or

    (b) Show how microscopic property of atomic polarizability is related to macroscopic dielectric constant by obtaining expressions for Lorentz internal field and Clausius-Mossotti equation.   (16)

12. (a) (i) Derive expressions for density of energy states in a solid. (8)

(ii) Explain how electrons behave in a periodic potential in a solid. (8)

Or

(b) Classify magnetic materials and explain diamagnetic, Paramagnetic and Ferromagnetic effects. (16)

13. (a) Derive carrier concentration in an intrinsic semiconductor and from the results, obtain an expression for density of electrons an N-type semiconductor. (16)

Or

(b) Explain the variation of carrier concentration with temperature in a P-type semiconductor using suitable theory and diagram. (16)

14. (a) Give the classification of Optical materials and explain the different optical processes in semiconductors. (16)

Or

(b) Explain Electro-Optic Modulators and switching devices in detail. (16)

15. (a) Explain the Single electron phenomena and the working of Single electron Transistor. (16)

Or

(b) Explain the properties and applications of Carbon nanotubes. (16)