Reg. No. : E N G G T R E E . C O M

Question Paper Code : 51504

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

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. What are high dielectric loss materials?
2. What are pyroelectricity and pyroelectric crystals?
3. What are degenerate states? Brief with an example.
4. Give a brief note on diamagnetism in solids.
5. Differentiate the direct and indirect band gap semiconductors.
6. Plot the energy band diagram of an ohmic contact junction.
7. How does light interact in an organic semiconductor device?
8. What is the origin of nonlinearity in optical materials?
9. Define the quantum tunneling effect.
10. What are spintronic devices?

PART B — (5 × 16 = 80 marks)

11. (a) Derive an expression for orientational polarization in dielectric materials. Discuss how it varies with the temperature of the dielectric material. (16)

Or

(b) Obtain an expression for internal field within the dielectric material and derive the Clausius-Mossotti equation. (16)

12. (a) Derive expressions for density of energy states in a solid and obtain the Fermi Energy of electrons in a material at 0 K. (16)

Or

(b) Obtain an expression for paramagnetic susceptibility of a solid and explain the behavior of paramagnetic solid with variation in temperature. (16)

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

Or

(b) Derive expressions for Carrier transport by drift and diffusion of electrons and holes in semiconductors. (16)

14. (a) Describe the optical processes in semiconductors with diagrams. (16)

Or

(b) Describe the construction and operation of an LED and Laser Diode. (16)

15. (a) Formulate expressions for Density of states for different dimensional quantum structures and explain its dependence on energy of the quantum structure. (16)

Or

(b) Explain the construction and working of Single Electron Transistor. (16)