

Unit IV

No. of Printed Pages : 4

Roll No.

8. Discuss UV visible spectroscopy for absorption and transmission in detail.
9. Discuss quantum wires and quantum well along with some practical examples. Write a short note on heterojunction.

18A9

B.Tech. EXAMINATION, 2024

(Second Semester)

(C Scheme) (Main & Re-appear)

(CSE)

SEMICONDUCTOR PHYSICS

PHY109C

Time : 3 Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) Calculate the position of Fermi level E_f at 400 K for germanium crystal containing 4×10^{21} arsenic atoms/m³.
(b) Calculate the density of states per unit volume with energies between 1 and 2 eV.
(c) Define density of states in 2-D and effective mass.
(d) Draw and discuss band diagram of heterojunction.

Unit I

2. (a) Discuss Quantum free electron theory and show how it was able to remove various difficulties.
(b) State Bloch theorem and write Bloch function.
3. Explain Kronig Penny model for the motion of a electron in a periodic potential. Show from E-K graph that the material can be classified into conductors, semiconductors and insulators.

Unit II

4. What are intrinsic semiconductors ? Derive an expression for density of electrons in conduction band and density of holes in valence band in an intrinsic semiconductor.
5. What is optoelectronics and optoelectronic devices ? Which semiconductors are used in optoelectronic devices and why. Discuss construction and working of an optoelectronic device made with the help of semiconductors.

Unit III

6. (a) Discuss spontaneous emission, stimulated emission and stimulated absorption in detail. Also find relation between Einstein coefficients.
(b) Discuss density of states for photons.
7. Derive an expression for Drude model. What are its assumptions ? Also discuss its failures.