Central University of Haryana
Term End Examinations, March 2023 B.Tech. Programmes

Course Code: : BT PHY 117 A
Branch: CSE
Course Title: Semiconductor Physics

Max Time: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) What is Laser?
(b) Describe the differences between Stimulated Emission and Spontaneous Emission
(c) what are the important applications of solar cells
(d) what are the main drawbacks of free electron theory
(e) What are the differences between intrinsic and extrinsic semiconductor
(f) Define fermi energy
(g) What is the need to achieve population inversion?

PART –II

Q. No.2 Discuss in detail the Kronig – Penny model for a linear lattice. How does it lead to the formation of energy band in solids?

OR

Q. No.2
The Fermi energy of copper is 7 eV. Calculate (a) The Fermi momentum of electron in copper. (b) de Broglie wavelength of the electron and (c) the Fermi Energy

Q. No.3
Discuss the effect of donor and acceptor impurities in semiconductors. Explain the action of a P-N junction diode and mention its important applications.

OR

Q. No 3
Mobilities of electron and holes in a sample of intrinsic germanium at room temperature are 0.37 $m^2/V.s$ and 0.18 $m^2/V.s$, respectively. If each electron and hole densities is equal to $2.5X10^{19}/m^3$, calculate the electrical conductivity and the resistivity of germanium.

Q. No.4
What is Hall effect? Explain the terms, mobility of charge carriers and Hall effect. Obtain the expression of Hall coefficient in terms of current density and electronic charges.

OR

Q. No .4
Explain Fermi-Dirac distribution function. Plot this function for various temperatures including 0K. Determine the resistivity by Four Probe Method.

Q. No.5
Describe the density of states for 3D, 2D, 1D and 0D systems.
OR

Q. No.5
Describe the Quantum Wells/Dots and Nanowires and its application in Nanoscience.