Chandigarh Engineering College/COE Landran, Mohali

Department of Applied Sciences

MST-1

B.Tech 1st Year / 1st Semester, Branch: CSE/IT

Subject Name: Semiconductor Physics **Subject Code: BTPH 104-18**
Time: 60 min **Name:**
Max Marks: 24 **Roll No.** | | | | | | | |
Date of Exam: 14/12/2020

Note: Section A is compulsory. Attempt any two questions from section B and two questions from section C.

Course Outcomes

CO1: At the end of the course, the student will be able to understand and explain the fundamental principles and properties of electronic materials and semiconductors.
CO2: At the end of the course, the student will be able to Understand and describe the interaction of light with semiconductors in terms of fermi golden rule.
CO3: At the end of the course, the student will be able to Understand and describe the impact of solid-state device capabilities and limitations on electronic circuit performance.
CO4: At the end of the course, the student will be able to understand the design, fabrication, characterization techniques, and measurements of engineered semiconductor materials.
CO5: At the end of the course, the student will be able to develop the basic tools with which they can study and test the newly developed devices and other semiconductor applications.

Section A (8 Marks)	Marks Distribution	Relevance to CO no.
Q1: - Draw the density of states versus energy diagram for 1-D and 3-D?	2	(CO1)
Q2:- State Bloch theorem.	2	(CO1)
Q3:- Write three main differences between direct and indirect band gap semiconductors?	2	(CO3)
Q4:- Show the dependency of intrinsic conductivity of semiconductor with the rise in temperature, graphically.	2	(CO1)
Section B (8 Marks)		
Q5: - What is Kronig Penny equation? Also discuss its conclusion with the help of diagram.	4	(CO1)
Q6: Differentiate between intrinsic and extrinsic semiconductors.	4	(CO1)

Q7: - Derive Wiedemann – Franz law and discuss how much variation is there in the experimental and theoretical values of Lorentz number.	4	(CO3)
Section C (8 Marks)		
Q8: - Prove that the concentration of free electrons in an intrinsic semiconductor is given by $n = N_C\, e^{-(E_c - E_F)} k_B T$, where $N_C = 2[2\pi m_e^* k_B T/h^2]^{3/2}$	4	(CO1)
Q9:- Discuss the various drawbacks of classical free electron theory of metals and explain the assumptions made by Sommerfeld for Quantum free electron theory.	4	(CO1)
Q10:- Derive an expression for effective mass of electron.	4	(CO1)