

7. (a) Describe by Drude model the response of a solid to an oscillating electromagnetic field and obtain an expression for the dielectric function in terms of the plasma frequency. **10**
- (b) What do you mean by optical loss and gain ? **5**

Unit IV

8. (a) Explain four point probe method for determination of resistivity of a semiconductor. **10**
- (b) Write a short note on hall mobility. **5**
9. (a) Explain design and fabrication of quantum wires. **10**
- (b) Give practical examples of quantum dots and wires. **5**

No. of Printed Pages : 04

Roll No.

18A9

B. Tech. EXAMINATION, 2022

(Second Semester)

(C Scheme) (Main & Re-appear)

CSE

PHY109C

Semiconductor Physics

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. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) What do you understand by Fermi level?
Explain its significance in metal and semiconductors. **3**
- (b) What is significance of negative effective mass ? **3**
- (c) What is meant by potential barrier across a PN junction ? **3**
- (d) What are excitons ? **3**
- (e) What are quantum dots ? **3**

Unit I

2. (a) Discuss Kronig-Penney model for the energy band structure of solids and show that the energy spectrum of electrons consist of a number of allowed energy bands separated by forbidden regions. **10**
- (b) Explain the concept of density of states for a free electron gas. **5**
3. (a) What is the concept of effective mass ?
Discuss what information does one obtain about the effective mass of electrons moving in a periodic potential. **10**
- (b) Describe phonons. **5**

Unit II

4. (a) Distinguish between intrinsic and extrinsic semiconductors. Obtain an expression for the carrier concentration for an intrinsic semiconductor. **10**
- (b) Compare the density of charge carrier in a pure silicon crystal at two temperatures 27°C and 57°C eg. for Si in 1.1 eV. **5**
5. (a) Explain the term depletion layer across PN junction. Obtain the expression for the width of the depletion layer in terms of the impurity concentrations and barrier potential. **10**
- (b) Explain, how Ohmic contact are made. **5**

Unit III

6. (a) Describe Fermi's Golden rule. **8**
- (b) Explain under what conditions stimulated emission of radiation can take place ?
What are characteristics of such radiations ? **7**