

3003

B. Tech. (CSE) 1st Semester
Examination – February, 2022

SEMICONDUCTOR PHYSICS

Paper : BSC-PHY-103G

Time : Three Hours]

Maximum Marks : 75

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

Note: Students have to attempt five questions in all selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (i) What do you mean by drift velocity of electrons, how is it related to mobility of free electrons ?
- (ii) What is the cause of failure of free electron theory ?
- (iii) Explain the term doping and its need.
- (iv) Write about the phonons.

Write about the density of states.

(vi) What is Drude Model of gas of free electron.

25.6 15

UNIT – I

2. (a) Deduce the relation for effective mass of an electron. Show how it differs from the rest mass of the electron ? 9
- (b) What are E-K diagrams ? 6
3. (a) Discuss the origin of energy bands in solid on the basis of Kronig-Penny model. 10
- (b) What is the difference between metals, insulators and semiconductors ? 5

UNIT – II

4. Explain Fermi Dirac distribution functions. Explain how this function varies with temp. Evaluate the Fermi function for energy KT above the Fermi energy. <https://www.mdustudy.com> 15
5. (a) What is doping ? What are extrinsic semiconductors ? Explain the term donor and acceptors. 9
- (b) Differentiate between Schottky contacts and normal P-N junction contact. 6

UNIT – III

6. (a) What are density of states ? Derive an expression for density of states for semi-conductor substances. 9
- (b) What are exciton ? Write their role in process of luminescence. 6
7. (a) On account of Fermi's golden rule discuss the transition rate in a semiconductor material. 6
- (b) Give the assumption of Drude model for free electron theory. Derive the electrical conductivity of a metal. 9
9. (a) What do you mean by Fabrication of junctions ? Write the types of junctions based on different fabrication methods. 9
- (b) Write short note on : 6
- (i) Semiconductor Quantum Well
 - (ii) Quantum Wire
 - (iii) Quantum Dot

UNIT – IV

8. (a) Explain Deep Level transient spectroscopy and UV-visible spectrometer. 12
- (b) The saturation current density of a p-n junction Ge diode is 250 mA/m^2 at 300 K. Find the voltage that would have to be applied across the junction to cause a forward current density of 10^5 A/m^2 to flow. 3