Roll No. ....

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.

P. T. O.

   (v) Write about the density of states.

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

                                            2 ⁵. 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 one E-K diagrams ?   6

3. (a) Discuss the origin of energy bands is solid on the basis of Kronig-Penny model.   10

   (b) What is the difference between metals, insulators and semi conductors ?   5

UNIT – II

4. Explain Fermi Dirac distribution functions. Explain how this functions 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**

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/m² 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/m² to flow. **3**

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