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.

(v) Write about the density of states.

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

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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/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

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