

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

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Roll No. ....

**3003**

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

**SEMICONDUCTOR PHYSICS**

Paper : BSC-PHY-103C

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.

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(v) Write about the density of states.

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

$$2.5 \times 6 = 15$$

### 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 semi conductors? 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. 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

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### UNIT - III

6. (a) What are density of states? Derive an expression for density of states for semiconductor substances. 9  
(b) What are excitons? 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  $250 \text{ mA/m}^2$  at  $300 \text{ K}$ . Find the voltage that would have to be applied across the junction to cause a forward current density of  $10^8 \text{ A/m}^2$  to flow. 3

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