Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (CSE/IT) (2018 Batch) (Sem.–1,2)

SEMI-CONDUCTOR PHYSICS

Subject Code : BTPH-104-18

M.Code : 75360

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

Write briefly : **[2×10=20]**

1. What do you understand by free electron gas model of metals?
2. Discuss the physical significance of the wave function ψ.
3. State Bloch's theorem for a periodic system.
4. How n-type and p-type semiconductors are produced?
5. What do you mean by negative effective mass of electron?
6. The threshold wavelength of a photo diode is 750 nm. Calculate the energy gap in the photo diode in electron volts.
7. Explain the term absorption and spontaneous emission of radiation.
8. Why four probes are required for the measurement of resistivity of semiconductor in four probe method?
9. What do you mean by effective mass of electron?
10. What physical parameters can be known from I-V characteristics of diode?

SECTION-B

11. Obtain an expression for thermal conductivity of a metal on the basis of free electron theory. [8]

12. What is the effect of periodic potential on the energy of electrons in a metal? Explain it on the basis of Kronig Penny model and explain the formation of energy bands. [8]

13. Derive an expression for the densities of electrons and holes in the conduction and valence bands respectively of an intrinsic semiconductor. [8]

14. a) Distinguish between intrinsic and extrinsic semiconductors with suitable examples. [4]

    b) Differentiate metals, semiconductors and insulators on the basis of band theory. [4]

SECTION-C

15. What do you mean by population inversion? Obtain a relation between transition probabilities of spontaneous and stimulated emission. [3+5=8]

16. How does a semiconductor laser differ from other laser? Explain main features of the semiconductor laser and its applications. [8]

17. What physical parameters can be measured form capacitance-voltage measurements? Describe a method for the measurement of divergence and wavelength of light. [3+5=8]

18. Discuss with proper diagram about the measurement of carrier density, resistivity and hall mobility by van der Pauw method. [8]

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.