

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (CSE/IT) (2018 & Onwards) (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 :

- Q1. The energy of an electron in a metal is quantised. Explain.
- Q2. Discuss the physical significance of the wave function Ψ .
- Q3. Explain Fermi-Dirac distribution function. Plot this function for various temperatures including 0 K.
- Q4. Explain the significance of Brillouin zone with particular reference to any cubic lattice.
- Q5. What do you mean by effective mass of electron?
- Q6. How photonic devices work.
- Q7. What are the differences between stimulated and spontaneous emission?
- Q8. Why four probes are required for the measurement of resistivity of semiconductor in four probe method.
- Q9. What is Schottky barrier diode?
- Q10. What is exciton?

SECTION-B

- Q11. Discuss quantum theory of free electrons in metals. Derive an expression for the fermi energy at absolute zero. [8]
- Q12. 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]
- Q13. Derive an expression for the densities of electrons and holes in the conduction and valence bands respectively of an intrinsic semiconductor [8]
- Q14. (a) What are n-type and p-type semiconductors? Show the acceptor and donor levels with neat diagram. [4]
- (b) Explain with diagrams forward and reverse biasing of a p-n junction. What is meant by avalanche breakdown? [4]

SECTION-C

- Q15. What do you mean by population inversion? Obtain a relation between transition probabilities of spontaneous and stimulated emission. [3+5=8]
- Q16. How does a semiconductor laser differ from other laser? Explain main features of the semiconductor laser and its applications. [8]
- Q17. What is photoconductivity? Explain principle and construction of a photovoltaic cell. [2+6=8]
- Q18. What physical parameters can be measured from capacitance-voltage measurements? Describe a method for the measurement of divergence and wavelength of light. [3+5=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.