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.