

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (AI & ML/CSE/DS/IT/Robotics & Artificial Intelligence/Internet of Things and Cyber Security including Block Chain Technology/ME)
(Sem.-1,2)

SEMI-CONDUCTOR PHYSICS

Subject Code : BTPH/104/18

M.Code : 75360

Date of Examination : 15-05-2024

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 :

1. What is effective mass?
2. Define Fermi energy.
3. In a solid, consider the energy level lying 0.02 eV above Fermi level. What is the probability of this level being occupied by an electron at 100 K?
4. What is Schottky junctions?
5. What kind of semiconductor materials can be used for optoelectronics devices?
6. Obtain the probability of emission for Spontaneous emission.
7. When a laser has 2 V applied to it, it draws 20 mA and produce 2 mW of optical power. What is the efficiency of laser?
8. What is Hot-point probe measurement?
9. Define laser divergence.
10. Discuss the advantages of four probe method over two probe method.

SECTION-B

11. Discuss the failure of Classical free electron theory. What are the special features of quantum free electron theory of metals? Derive an expression for the electrical conductivity of a metal.
12. State Bloch's theorem for particles in a periodic potential. Explain the origin of energy bands using Kronig-Penny model.
13. What are diffusion and drift current? Explain the origin of contact potential, while formation of p-n junction.
14. Obtain the expression for carrier concentration in n-type extrinsic semiconductor.

SECTION-C

15. Explain the principle, construction and working of a homo-junction semiconductor laser with diagram. Discuss the demerits of homojunction semiconductor laser.
16. (a) What is Fermi's Golden rule?
(b) Write a note on Optical loss and gains.
(c) Explain Photovoltaic effect.
17. What is Four-point probe method? How to calculate the hall mobility using Four-point probe method?
18. What is Capacitance-voltage measurements? What information can be obtained using it?

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.