

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ECE) (2018 Batch) (Sem.-1,2)
SEMI-CONDUCTOR AND OPTOELECTRONICS PHYSICS

Subject Code : BTPH-105-18

M.Code : 75363

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

1. Write briefly : [2×10=20]

- a) What are the limitations of free electron theory?
- b) Discuss the physical significance of the wave function ψ .
- c) What are Brillouin zones?
- d) How n-type and p-type semiconductors are produced?
- e) What is the characteristic difference between metals and semiconductors from the consideration of temperature coefficient of resistivity?
- f) The threshold wavelength of a photo diode is 750 nm. Calculate the energy gap in the photo diode in electron volts.
- g) Explain the term absorption and spontaneous emission of radiation.
- h) Why four probes are required for the measurement of resistivity of semiconductor in four probe method.
- i) What do you mean by effective mass of electron?
- j) What physical parameters can be known from I-V characteristics of diode?

SECTION-B

2. What are density of energy states in metals? Derive an expression for density of energy states of a metal. [8]
3. Discuss the Kronig-Penny model for the motion of an electron in a periodic potential. [8]
4. Derive an expression for the densities of electrons and holes in the conduction and valence bands respectively of an intrinsic semiconductor [8]
5. a) What do you mean by carrier generation and recombination process? [4]
b) Differentiate metals, semiconductors and insulators on the basis of band theory. [4]

SECTION-C

6. What do you mean by laser and its working principle? Obtain a relation between transition probabilities of spontaneous and stimulated emission. [3+5=8]
7. Discuss structure and working of PIN and Avalanche photodiodes. [8]
8. Discuss in detail the working and characteristics of light emitting diodes. [8]
9. Illustrate 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.