Roll No. 1201500476

Total Pages : 3

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B.Tech. (CE/CSE/IT) Ist Semester

SEMICONDUCTOR PHYSICS

(BSC101D)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

(i) It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.

(ii) Answer any four questions from Part-B in detail.

(iii) Different sub-parts of a question are to be attempted adjacent to each other.

PART–A

1. (a) What do you mean by donor and acceptor impurity? (1.5)

(b) Draw E-k diagram for a semiconductor using Kronig Penney model. (1.5)

(c) Define ohmic contacts. (1.5)

(d) What does Fermi level in band gap mean? (1.5)

(e) Which type of semiconductor has direct bandgap? Give one example. (1.5)

(f) Define exciton. (1.5)

(g) What is the basic principle of UV visible spectroscopy? (1.5)

(h) Differentiate between hetero-junction and homo-junction. (1.5)

(i) Give one example each of 1D, 2D and 3D nano-material. (1.5)

(j) Define stimulated emission. (1.5)

PART–B

2. (a) Show, with the help of Kronig Penney model, that band gap exists in the case of semiconductors. Also explain the concept of effective mass. (10)

(b) Define Fermi level. Show that it lies midway in the bandgap in intrinsic semiconductors. (5)

3. (a) Define the terms drift velocity and diffusion velocity. When p-n junction is forward biased which one is dominant and why? (5)

(b) What do you mean by an intrinsic semiconductor? Obtain an expression for the carrier concentration in an intrinsic semiconductor. (10)

4. Explain in detail one method to calculate the band gap experimentally. (15)

5. (a) Draw the characteristics of PN junction diode in forward and reverse biased conditions and also define the knee voltage. (10)

(b) Explain how the energy band gap of semiconductor material can be calculated using UV-Vis spectroscopy. (5)

6. (a) Compare a Schottky diode to a PN-diode. In which applications do Schottky diodes perform better than PN-diodes? (5)

(b) What do you mean by low dimensional structure? Classify the different type of low dimensional structure. (10)

7. (a) Draw the Fermi function at three temperatures lower, moderate and high. (5)

(b) Write the assumptions of Drude model and calculate the equation of conductivity using this model. (10)