Exam.Code:0905
Sub. Code: 6658

1128

B.E. (Electrical and Electronics Engineering)

First Semester

ECE-103: Introduction to Electronics

(Common with EC)

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) A Si sample is doped with 10^{16} B atoms/cm^3. What is the equilibrium electron concentration n0 at 300 K? Where is E_F relative to E_i? Assume n_i for Si at 300 K = $1.5x10^{10}$/cm^3.

b) Define mean life of a carrier.

c) What is the difference between optical band gap and electronic band gap?

d) Show that, intrinsic concentration density N_i for different semiconductor materials, is in a function of temperature.

e) In reverse bias condition, the current disappears, explain? (5x2)

UNIT – I

II. a) Show that the probability that a state ΔE above the Fermi level E_F is occupied is the same as the probability that a state &E below E_F is empty.

III. b) A sample of Si is doped with 10^{16} In atoms/cm^3. What will be the measured value of its resistivity? What is the expected Halt voltage in a 150 μm thick sample if I_x = 2mA and B_z = 5kG (1 kG = 10^{-5} Wb/cm^2)? (10)

IV. a) How is the drift and diffusion currents produced in semiconductor sample?

b) A silicon wafer contains 10^{16} cm^{-3} electrons. Calculate the hole density and the position of the intrinsic energy and the Fermi energy at 300 K. Draw the corresponding band diagram to scale, indicating the conduction and valence band edge, the intrinsic energy level and the Fermi energy level. Use n_i=10^{10} cm-^{3}. (10)

V. a) What is the difference between direct and indirect band gap semiconductor?

b) Explain the two mechanisms by which carriers move in a silicon crystal. (10)

P.T.O.

UNIT – II

VI. a) Draw and explain the IV characteristics for the diode at both the forward and reverse bias condition as dependent on temperature?

b) Draw a complete equivalent circuit for P-N diode. (10)

VII. a) Explain the difference between Avalanche breakdown and Zener breakdown.

b) What value of series resistor is required to limit the current through a LED to 20 mA with a forward voltage drop of 1.6 V when connected to a 10V supply? (10)

VIII. a) Why transistor is called current controlled device? Why silicon type transistors are more often used than germanium type?

b) Why is there a maximum limit of collector supply voltage for a transistor? Define why $I_{CEO} >> I_{CBO}$? (10)

x-x-x