Printed Pages : 3

NEC-302

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131313

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

FUNDAMENTAL OF ELECTRONIC DEVICES

Time : 3 Hours] [Total Marks : 100

Notes : Attempt all questions.

1 Attempt any four questions : 4×5=20

a. Describe briefly lattice structure of silion.

b. Si sample is doped with 10^{20} As atoms/cm^3. what is equilibrium concentration of holes at 300 K? Where is E_f (i.e. Fermi level). Draw the energy band diagram to show the position of E_i and E_f. Take $n_i = 1.5 \times 10^{10}$ cc.

c. Explain the effect of temperature and doping on mobility.

d. Show that the minimum conductivity of a semiconductor sample occur when $n_0 = n_i \sqrt{\mu_p / \mu_n}$. What is the expression for minimum conductivity.

e. Explain high field effect.

2 Attempt any two questions : 2×10=20

a. Derive the expression for current density in terms of diffusion length.

b. Explain the process of diffusion. Derive the expression of continuity equation.

c. Explain absorption coefficient. A 0.46 micrometer thick sample of Ga-As is illuminated with monochromatic light of hv= 3eV. The absortion coefficient is 6×10^4/cm. the power incident on the sample is 11 mW.

i. Find the total energy absorbed by the sample per second.

ii. Find the rate of excess thermal energy given up by the electrons to the lattice before recombination.

3 Attempt any four questions : 4×5=20

a. Write down the difference between Zener and avalanche breakdown.

b. Derive the expression for contact potential of a p-n junction.

c. Define junction capacitance and its types.

d. Write a short note on :

i. Varactor diode

ii. Switching diode

e. Consider a silicon abrupt P-N junction at 300 K with $N_a = 10^{18}$ cc and $N_d = 10^{15}$ cc. Taking $n_i = 1.5 \times 10^{10}$cc, calculate the value of contact potential. Calculate the width of depletion region.

4 Attempt any two questions. **2×10=20**

a. Explain the working of HEMT and also discuss its advantages.

b. Discuss briefly the principle of operation of depletion and enhancement type MOSFET.

c. Explain ebers-moll model.

5 Attempt any two questions : **10×2=20**

a. Write a short note on:

i. SCR

ii. Gunn diode

b. Write a short note on:

i. Double heterojunction LED

ii. Working principle of laser.

c. Explain the working of solar cell. Discuss open circuit output voltage characteristic and short circuit current characteristic.
