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

Paper ID : 131321 Roll No. | | | | | | | | | |

B.Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

FUNDAMENTALS OF ELECTRONICS DEVICES

[Time:3 hours] **[Total Marks:100]**

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (2x10=20)

   (a) What is degenerate semiconductor?

   (b) Why metal semiconductor contacts are faster than that of conventional diode?

   (c) Differentiate direct and indirect band gap semiconductors.

   (d) What is ionized impurity scattering.

   (e) How the effect of ionized impurity scattering is minimized in high electron mobility transistors?

   (f) Why 4th quadrant is preferred for solar cells?

   (g) What is florescence?

(h) Comment over the conductivity of semiconductor at 0K

(i) Define minority carrier diffusion length.

(j) Why Fermi energy level moves toward the middle of energy gap with increasing temperature.

Section-B

Attempt **any five** Questions from this section. (10×5=50)

2. Describe the Hall experiment in detail. Consider a semiconductor bar of length 10^{-1} cm, width 10^{-2} cm and thickness 10^{-3} cm. External applied voltage and resulting current (I_x) are 12.5V and 1mA respectively. Magnetic field applied in z-direction have intensity of 5×10^{-2} tesla. Calculate the majority carrier concentration and mobility if Hall voltage is V_H=-6.25mV.

3. Derive the equation governing the carrier flow mechanism under the influence of electric field.

4. Describe the excess carrier generation through photonic excitation in semiconductors. Derive the relation of transmitted and absorbed power. A 0.46 μ m thick sample of GaAs is illuminated with monochromatic light hv=2ev. The absorption coefficient α is $5\times10^{4}cm^{-1}$. The power incident on sample is 10mW, Calculate :

   a) total energy absorbed by sample per second.

   b) Rate of excess thermal energy given up by electrons to the lattice before recombination.

   c) number of photons per second given off from recombination events, assuming perfect quantum efficiency.

5. Derive the diffusion current density equation. Also, derive the equation relation the mobility and diffusion coefficient of semiconductor sample.

6. With the help of neat diagram describe the operation of IGFET.

7. Describe the transient variation of currrent, voltage and minority carrier profile for a P^+N diode if it is exited by a square wave.

8. With the help of neat diagram describe the operation of Tunnel diode.

9. Explain the V-I characteristics of a photodiode. What is the significance of third and fourth quadrant operation of photodiode?

Section-C

Attempt **any two** questions from this section. (15x2=30)

10. Discuss the formation of PN junction diode. Derive the equation of contact potential and depletion region width for P^+N diode.

11. Describe the constructional feature of Bipolar Junction Transistor. Describe various current components and amplifiation ratios. Also, mention the base current controls mechanism.

12. Describe in detail the operation of Shockley diode. Also, describe various triggering mechanism.

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