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B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/ DEC.2011

(Common to ECE,CSE and IT)

SECOND SEMESTER

PH9168 - PHYSICS FOR COMMUNICATION

(REGULATIONS 2008)

Time: 3 hr (Max. Mark: 100)

Answer ALL Questions

Part - A ($10 \times 2 = 20$ Marks)

1. Define thermal resistance.
2. What are degenerate states?
3. What are the differences between degenerate and non-degenerate semiconductors?
4. An n-type semiconductor has a Hall co-efficient $R_H = 3.66X10^{-11}m^3/As$. The conductivity is found to be $112X10^7/\Omega$ m. Calculate the carrier density and the electron mobility at room temperature.
5. What is meant by electroluminescenc? Give an example.
6. What are the advantages of an organic LED?
7. What is meant by giant magnetoresistance?
8. What are the differences between a hologram and a photograph?
9. What is the use of growing single crystals?
10. Define LSI, MSI and VLSI circuits.

Part - B ($5 \times 16 = 80$ Marks)

11. (a) i. Describe, with suitable diagrams, the principle, construction and working of a LCD. (12)

    ii. Will a silicon ($E_g = 1.1eV$) photodetector be sensitive to radiation emitted from a GaAs ($E_g = 1.42eV$) laser? Justify your answer. (4)

12. (a) i. Based on the classical theory of free electrons, derive an expression for the electrical conductivity of metals. (12)

    ii. A conduction wire has a resistivity of $1.54X10^{-8}\Omega$ m. The Fermi energy is 5.5 eV and there are $5.8X10^{28}$ electrons per m^3. Calculate (i) the relaxation time and mobility (ii) mean free path of the electron. (4)

(OR)

(b) i. Obtain the Schrödinger equation for a free electron. (8)

ii. Explain the quantum mechanical properties of an electron which is bound by a square well potential. (8)

13. (a) i. With necessary theory, derive an equation for the concentration of holes in the valence band of an intrinsic semiconductor. (12)

ii. An N-type Si is doped uniformly with Sb atoms with a donor concentration of 10^{16} atoms per cm^3. Calculate the Fermi energy of doped Si with respect to the Fermi energy in intrinsic Si. (For Si, $n_i = 1.45 \times 10^{10} cm^{-3}$). (4)

(OR)

(b) i. What is Hall effect? Discuss in detail about the Hall experiment and deduce an expression for the Hall co-efficient. (12)

ii. Mobilities of electrons and holes in a sample of intrinsic Ge at 300 K are $0.36 m^2/Vs$ and $0.17 m^2/Vs$ respectively. If the resistivity of the specimen is 2.12 Ω m, compute the forbidden energy gap for Ge. (4)

14. (a) Discuss in detail about the various types of magnetic disk memories. (16)

(OR)

(b) i. Explain in detail about the construction and working of a hologram. (12)

ii. What is meant by photorefractive storage systems? (4)

15. (a) i. Discuss in detail about any one of the techniques used to grow a single crystal from melt. (8)

ii. With necessary diagrams, describe the experimental technique used to form a resistor and a capacitor. (8)

(OR)

(b) Describe a method to form a basic monolithic integrated circuit. How could you form an inductor using either semiconductor or thin film techniques? (16)