H 1473

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Second Semester

Bio-medical Engineering

PH 135 — MATERIALS SCIENCE

(Common to Electronics and Communication Engineering and Metallurgical Engineering)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Calculate the interplanar spacing for (321) plane in simple cubic lattice with interatomic spacing of 4.12 Å.

2. What is meant by point defect in a crystal lattice what are the different types?

3. Write down the expression for Fermi-Dirac distribution function and plot it as a function of energy.

4. The superconducting transition temperature (T_c) for mercury with isotopic mass 199.5 is 4.185 K. Calculate the value of T_c when its mass changes to 203.4

5. The Hall coefficient of a certain specimen is found to be -7.35×10^{-5} m^3c^{-1} from 100 to 400 K. Determine the nature of the material. If the electrical conductivity is found to be 200 $ohm^{-1}m^{-1}$, calculate the mobility.

6. The intrinsic carrier density at room temperature of a semiconductor is $2.37\times10^{19}/m^3$. The mobilities of electron and holes are 0.38 and $0.18\,m^2v^{-1}s^{-1}$. Calculate the resistivity.

7. What is hysteresis? Draw a hysteresis curve for a soft magnetic material.

8. Distinguish between polar and non-polar substances.

9. What is photo electric effect?

10. What are the different phosphors used in CRO screens?

PART B — (5 × 16 = 80 marks)

11. (i) Show that a five-fold rotation axis does not exist in a crystal lattice.

(ii) Derive Bragg's law of X-ray diffraction in crystals.

(iii) Give an account of powder method of crystal structure analysis. (4 + 3 + 9)

12. (a) (i) What are density of states in metals? Derive an expression for the density of states.

(ii) Draw the density of states of a metal and insulator.

(iii) Find the lowest energy of an electron confined to move in a one dimensional box of length 0.5 Å. (10 + 2 + 4)

Or

(b) (i) How a superconducting state is distinguished from a normal state?

(ii) When a metal goes from a normal state to a superconducting state which properties get changed and which does not?

(iii) Explain Meissner effect.

(iv) Discuss two applications of superconductors one in medicine and another one in electrical engineering. (2 + 6 + 4 + 4)

13. (a) (i) What is an intrinsic semiconductor?

(ii) Give two examples.

(iii) Assuming Fermi-Dirac distribution, derive an expression for the concentration of electrons per unit volume in the conduction band of an intrinsic semiconductor. (2 + 2 + 12)

Or

(b) (i) What is Hall effect?

(ii) Describe an experimental set up to measure the Hall coefficient.

(iii) Explain how it can measure the mobility, conductivity, Hall co-efficient and Hall angle. (2 + 2 + 12)

14. (a) (i) Differentiate between diamagnetic, paramagnetic and ferro magnetic substances on the basis of susceptibility.

(ii) What is a magnetic domain?

(iii) What are its characteristics?

(iv) On the basis of domain theory explain ferro magnetism. (2 + 2 + 2 + 10)

Or

(b) (i) What is meant by internal field in a solid dielectric?

(ii) Deduce an expression for the local field for structures with cubic symmetry.

(iii) Obtain Clausius-Mosotti equation. (2 + 6 + 8)

15. (a) (i) What is a LCD?

(ii) What are the different types?

(iii) Explain briefly the construction and working of a field effect type of LCD.

(iv) What are the advantages? (2 + 2 + 8 + 4)

Or

(b) (i) What is luminescence?

(ii) What are the different types?

(iii) What is an exciton?

(iv) What are the different types?

(v) What is a trap and what are different kinds of traps? (2 + 3 + 2 + 3 + 6)

---

upload your college symposium/conference details,function photos,videos in www.technicalsymposium.com