L 1154

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

Second Semester

Chemical Engineering

PH 1156 — PHYSICS – II

(Common to Textile Technology, Biotechnology, Textile Technology (Textile Chemistry), Polymer Technology and Textile Technology (Fashion Technology))

(Regulations 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. The thermal conductivity of a metal is 123.92 W/m/k. Find the electrical conductivity and Lorentz number when the metal possess relaxation time 10^{-14} second at 300 K. (Density of electrons = $6 \times 10^{28}/m^3$).

2. What are high temperature superconductors?

3. Explain the concept of hole in semiconductors.

4. Define Hall effect and Hall voltage.

5. What is the domain theory of ferromagnetism?

6. Classify any four insulating materials with examples.

7. Name any four applications of metallic glasses.

8. How will you characterise SMA by Hysteresis method?

9. What is M scan and give one application of it?

10. What are the different sources of radioactivity materials and mention its uses?

PART B — ($5 \times 16 = 80$ marks)

11. (i) Derive an expression for electrical conductivity using classical free electron theory. (7)

(ii) Distinguish the various properties of soft and hard super conductors. (4)

(iii) With neat diagram explain SQUID. Name any three applications of it. (3 + 2)

12. (a) (i) Derive an expression for carrier concentration of electrons in conduction band of an intrinsic semiconductor. (8)

(ii) Explain with neat diagram the variation of Fermi level with temperature in intrinsic and extrinsic semiconductor. (5)

(iii) The intrinsic carrier density at room temperature in Ge is $2.37 \times 10^{19}/m^3$. If the electron and hole mobilities are 0.38 and 0.18 $m^2/v/s$ respectively. Calculate the resistivity. (3)

Or

(b) (i) Derive an expression for carrier concentration of holes in p–type semiconductor. (10)

(ii) The Hall coefficient of certain silicon specimen was found to be $-7.35 \times 10^{-5}\ m^3/c$ from 100 to 400 K. Determine the nature of the semiconductor. If the conductivity was found to be 200/m/n, calculate the density and mobility of the charge carrier. (4)

(iii) Mention four applications of Hall effect. (2)

13. (a) Explain

(i) Weiss molecular theory in ferromagnetism. (8)

(ii) Heisenberg's theory of ferromagnetism. (6)

(iii) Any two breakdown mechanism in dielectrics. (2)

Or

(b) (i) Derive an expression for internal field in dielectrics. (8)

(ii) Explain ionic and orientational polarisation. (4 + 4)

14. (a) (i) What are metallic glasses and shape memory alloys? (3)

(ii) Mention the four applications of shape memory alloys. (4)

(iii) Explain the following ceramics:

Ferroelectric, piezoelectric and superconducting. (9)

Or

(b) (i) Explain the properties of thermal, electrical, mechanical and chemical ceramic fibres. (12)

(ii) How will you prepare metallic glasses by melt spinning method? (4)

15. (a) (i) Draw a neat block diagram of basic pulse echo system and explain it. (8)

(ii) Describe "phonocardiograph". (5)

(iii) What is called "statistical aspect" in the use of radio isotopes? (3)

Or

(b) (i) Explain scintillation detector. (4)

(ii) Explain how nuclear medicine imaging devices are used. (8)

(iii) Describe the position camera. (4)
