

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Second Semester

Electrical and Electronics Engineering

PH 1151 — PHYSICS — II

(Common to : Electronics and Instrumentation Engineering, and Instrumentation  
and Control Engineering)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Resistivity of copper is  $1.73 \times 10^{-8}$  ohm-m. Its density is  $8.92 \times 10^3$  kg/m<sup>3</sup> and atomic weight is 63.5. Assuming classical laws, calculate the mobility of electrons.
2. Define Fermi energy and Fermi level.
3. What are elemental semiconductors and compound semiconductors?
4. Distinguish between type I and type II superconductors.
5. Magnetic field intensity of a paramagnetic material is  $10^4$  A/m. At room temperature, its susceptibility is  $3.7 \times 10^{-3}$ . Calculate the magnetization in the material.
6. State the applications of ferrites.
7. Mention the various dielectric breakdown mechanisms.
8. Distinguish between fluorescence and phosphorescence.
9. State the advantage of using metallic glass as transformer core material.
10. What is optical phase conjugation?

PART B — (5 × 16 = 80 marks)

11. (i) Explain biomaterials and their applications in medicine. (12)
- (ii) Describe optical mixing. (4)

12. (a) (i) Explain the working of twisted nematic LCD. (10)  
(ii) Compare LED and LCD. (6)

Or

- (b) Derive Clausius-Mosotti equation and explain its use in predicting dielectric constant of solids. (16)

13. (a) (i) Discuss Langerin's theory of paramagnetism. (12)  
(ii) What are hard and soft magnetic materials? (4)

Or

- (b) Write an essay on different magnetic storage media. (16)

14. (a) Derive expressions for density of electrons and density of holes in intrinsic semiconductors. (16)

Or

- (b) (i) Explain Meissner effect and magnetic levitation. (8)

- (ii) Discuss the applications of superconductors. (8)

15. (a) (i) Derive an expression for density of states. (10)  
(ii) State the merits and demerits of classical free electron theory. (6)

Or

- (b) (i) Draw E-k curve for an electron moving in a periodic potential. (10)

- (ii) Density of free electrons in aluminium is  $18.1 \times 10^{28} \text{ m}^{-3}$ . Calculate its Fermi energy at zero Kelvin. (6)

( $h = 6.62 \times 10^{-34} \text{ Js}$  and  $m_e = 9.1 \times 10^{-31} \text{ kg}$ ).