Reg. No. : | | | | | | | | | | | |

M 2510

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Third Semester

Electrical and Electronics Engineering.

PH 231 — MATERIALS SCIENCE

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Give the electrical conductivity expression and explain the terms.

2. Explain Meissner effect in superconductors?

3. What are elemental and compound semiconductors? Give one example each.

4. Explain graphically the variation of resistivity of semiconductors with temperature and explain your answer?

5. List the different types of magnetic materials.

6. Explain dielectric loss.

7. What are colour centres?

8. Explain photoconductivity.

9. What are nanophase materials?

10. Give any two biomaterials with their uses.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the drawbacks of classical free electron theory and (6)

(ii) Explain using Wiedemann–Franz law, the necessity for an alternate theory. (10)

Or

(b) (i) Explain Fermi Distribution function. (4)

(ii) Use it to calculate the Fermi energy of electrons in a solid. (12)

12. (a) (i) Derive the expressions for carrier concentrations in N and P type semiconductors. (8)

(ii) Explain the variation of Fermi level with temperature for N and P type semiconductors. (8)

Or

(b) (i) What is Hall Effect? (2)

(ii) Derive a relation for Hall coefficient and (8)

(iii) Explain how you would experimentally measure it. (4)

(iv) What will be your inference from the experimental result? (2)

13. (a) (i) Give the Heisenberg's interpretation for internal filed in ferromagnetic materials. (10)

(ii) Explain ferromagnetism and hysteresis with domain theory concept. (6)

Or

(b) (i) Derive an expression for internal field in a dielectric. (6)

(ii) Use it to derive the Clausius–Mosotti equation and state its significance. (10)

14. (a) (i) What are the types of liquid crystal displays (LCDs)? (4)

(ii) Explain the construction and working of a LCD. (12)

Or

(b) Write notes on :

(i) Thermography and (8)

(ii) Photoconducting materials and their applications. (8)

15. (a) (i) What are metallic glasses? Discuss its uses. (8)

(ii) Write a note on advanced ceramic materials. (8)

Or

(b) (i) What are shape memory alloys? Describe with two examples and two applications. (8)

(ii) Write a note on non-linear materials and their applications. (8)
