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

Question Paper Code: 21003

B.E. / B.Tech. DEGREE EXAMINATION, OCTOBER 2014.

Second Semester

Civil Engineering

01UPH203 - MATERIAL SCIENCE

(Common to Mechanical Engineering)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State Wiedemann-Franz law?
2. Write any two drawbacks of the classical free electron theory of metals.
3. Distinguish between Elemental and Compound semiconductors.
4. What is Hall Effect?
5. Magnetic field intensity of a paramagnetic material is 10^4 A/m. at room temperature, its susceptibility is 3.7×10^{-3}. Calculate the magnetization in the material.
6. Define Cooper pairs?
7. Define dielectric loss?
8. Give any two applications of ferroelectric materials.
9. What is shape memory effect?
10. Mention any four properties of metglasses.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for electrical conductivity and thermal conductivity of a conductor and hence obtain wiedemann - Franz law. (16)

Or

(b) Derive an expression for density of states in a metal and hence obtain the Fermi energy interms of density of free electrons at 0K. (16)

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

(ii) Discuss the variation of Fermi level with temperature in intrinsic semiconductor. (4)

Or

(b) Obtain an expression for the Hall coefficient for a p-type semiconductor. Describe an experimental setup for the measurement of Hall voltage and give its applications. (16)

13. (a) (i) Distinguish between soft and hard magnetic materials. (8)

(ii) Explain hysteresis curve on the basis of domain theory of ferromagnetism. (8)

Or

(b) (i) Discuss the different types of super conductors. (8)

(ii) Describe the BCS theory of super conductivity. (8)

14. (a) (i) Discuss the different types of polarisation in dielectric materials. (8)

(ii) Derive an expression for the ionic polarizability. (8)

Or

(b) Deduce an expression for the local field in a solid dielectric and hence obtain clausius – mosotti relation. (16)

15. (a) Discuss in detail the characteristics of Shape Memory Alloys(SMA) and application of SMA. (16)

Or

(b) Discuss different types of techniques using synthesis of nano-phase materials and give its applications. (16)
