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

Question Paper Code: 51203

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Second Semester

Mechanical Engineering

15UPH203 – MATERIAL SCIENCE

(Common to Chemical Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Frankel and Schottky imperfections are

   (a) dislocations in ionic crystals (b) Grain boundaries in covalent crystals
   (c) Vacancies in ionic crystals (d) Vacancies in covalent crystals

2. Entropy of closed system is

   (a) finite (b) infinite (c) 0 (d) 1

3. The electronic polarizability αe of a mono atomic gas atom where R is the radius of circular orbit is

   (a) $4\pi\epsilon_0$ (b) $4\pi\epsilon_0 R$ (c) $4\pi\epsilon_0 R^3$ (d) $4\pi\epsilon_0 R^2$

4. With increase in temperature, the orientation polarization in general

   (a) increases (b) decreases (c) is constant (d) none of these

5. P type semiconductor is electrically

   (a) neutral (b) negative (c) positive (d) all the above

6. For silicon doped with trivalent impurity

(a) $n_e >> n_h$ (b) $n_h >> n_e$ (c) $n_e > n_h$ (d) $n_e < n_h$

7. The fundamental quantity of magnetic moment is

(a) electronic charge (b) Bohr magnetron
(c) a and b are correct (d) a and b are wrong

8. Current conduction in super conductors is due to

(a) Free electrons (b) Cooper pair of electrons
(c) a and b are correct (d) a and b are wrong

9. Metallic glasses have the properties of both

(a) metal-alloys (b) metal glasses
(c) solid alloys (d) none of these

10. Range of nano materials is

(a) 10^{-6}m (b) 10^{-9}m (c) 10^{-12}m (d) 10^{-16}m

PART - B (5 x 2 = 10 Marks)

11. What are Frankel and Schottky imperfections in crystals?

12. Give the reason for dielectric loss.

13. What is fermi energy level?

14. Explain the principle of SQUID.

15. Write a short notes on Carbon nano tube?

PART - C (5 x 16 = 80 Marks)

16. (a) List the mechanical properties of solids. Explain the method of testing the creep and hardness of a solid. (16)

Or

(b) State Boyle's law and Charle's law. Obtain the expression for enthalpy of perfect gas. (16)

17. (a) Obtain the expression for electrical and thermal conductivity of conductors on the basis of classical free electron theory. (16)

Or

(b) Obtain the expression for the internal field and derive the Claussius Mosotti equation. (16)

18. (a) Distinguish between intrinsic and extrinsic semiconductors. Explain the variation of the Fermi level with temperature in intrinsic semiconductor. (16)

Or

(b) What is hall effect? Explain the method of determining the hall coefficient using hall effect setup. Give the application of this experiment. (16)

19. (a) Classify dia, para and ferro magnetic materials with examples. Explain the domain theory of ferromagnetism. (16)

Or

(b) What are type I and type II superconductors? Explain the BCS theory of superconductivity. (16)

20. (a) What are metallic glasses? Describe the method of preparation of the metallic glasses. Give few properties of metallic glasses. (16)

Or

(b) What are nano materials? Explain the physical vapour deposition technique to fabricate. Give few applications of nano materials. (16)