Reg. No. :

Question Paper Code: 32003

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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 any two postulates of classical free electron theory of metals.

2. Find the Fermi function value, if the energy of a state 'E' is equal to Fermi energy 'E_F'.

3. Define intrinsic semiconductor and give an example.

4. Write down the properties of compound semiconductors.

5. What is Bohr magnetron? Give its value.

6. What is Meissner effect in superconductors?

7. Define dielectric constant.

8. What is dielectric loss?

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 energy states and hence obtain the expression for carrier concentration in metals. (16)

12. (a) (i) Derive the expression for carrier concentration in n-type semiconductor. (10)

(ii) Discuss the variation of Fermi level of n-type semiconductor with temperature and impurity concentration. (6)

Or

(b) What is Hall effect? Derive an equation for Hall coefficient and explain an experiment to determine it. (16)

13. (a) (i) Explain domain theory of ferromagnetism on the basis of hysteresis curve. (10)

(ii) Distinguish between soft and hard magnetic materials. (6)

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) Define internal field. Obtain an expression for internal field for a cubical dielectric and hence deduce the Claussius-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)

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