Reg. No. :

Question Paper Code: 41023

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

Second Semester

Civil Engineering

14UPH203 - MATERIAL SCIENCE

(Common to Mechanical Engineering)

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Drift velocity of electron is the

    (a) flow of electron per unit field

    (b) average electron velocity per unit field strength

    (c) reciprocal of conductivity

    (d) displacement current

2. According to Wiedemann Franz law, thermal conductivity is proportional to

    (a) pressure   (b) temperature

    (c) current   (d) electron concentration

3. Germanium doped with boron is a

    (a) intrinsic semiconductor   (b) compound semiconductor

    (c) n-type semiconductor   (d) p-type semiconductor

4. Semiconductors have _____ temperature coefficient

    (a) positive   (b) negative   (c) neutral   (d) infinite

5. In the case of paramagnetic materials the spin magnetic moments of the adjutant atoms are aligned

   (a) parallel to each other   (b) antiparallel to each other

   (c) randomly   (d) antiparallel but of unequal magnitude

6. Decreasing the critical temperature with increasing of atomic mass is known as

   (a) flux quantisation   (b) heat capacity

   (c) isotopic effect   (d) entropy

7. In a dielectric, the polarization is

   (a) linear function of applied field   (b) square function of applied field

   (c) exponential function of applied field   (d) logarithmic function of applied field

8. The polarization that has low power loss is

   (a) Electronic   (b) Ionic   (c) Orientation   (d) Space charge

9. Nitinol is a

   (a) conducting polymer   (b) electrets

   (c) shape memory alloy   (d) thermo electric material

10. Materials that takes their own shape only upon heating are referred as

   (a) Two way shape memory   (b) One way shape memory

   (c) Three way shape memory   (d) none of these

<center>PART - B (5 x 2 = 10 Marks)</center>

11. Mention any four drawbacks of classical free electron theory of metals.

12. Mention the properties of semiconductor.

13. What is meant by superconductivity?

14. Define dielectric constant?

15. Briefly explain shape memory effect.

<center>PART - C (5 x 16 = 80 Marks)</center>

16. (a) (i) Arrive at a mathematical expression for electrical and thermal conductivity of a conducting material.   (10)

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(ii) What is Fermi distribution function? Discuss the effect of Fermi function with temperature. (6)

Or

(b) Define density of states and derive an expression for carrier concentration in metals. (16)

17. (a) What is intrinsic semiconductor? Derive an expression for carrier concentration in an intrinsic semiconductor. (16)

Or

(b) What is Hall Effect? Derive an expression for Hall coefficient in '*n*' type semiconductor. Mention any two applications of Hall effect. Describe an experimental set up for the measurement of Hall coefficient. (16)

18. (a) Distinguish in detail Dia, Para and Ferromagnetic materials with examples. (16)

Or

(b) (i) Explain domain theory of ferromagnetism. (12)

(ii) Distinguish hard and soft magnetic materials. (4)

19. (a) (i) Write brief notes on dielectric losses. (4)

(ii) Discuss in detail various types of dielectric breakdown mechanisms. (12)

Or

(b) (i) Explain the frequency and temperature dependence of polarization. (12)

(ii) Write a short note on Ferro electric materials. (4)

20. (a) What are shape memory alloys? Explain shape memory effect and pseudo elasticity. Discuss its various properties and applications. (16)

Or

(b) What is a metallic glass? Explain the preparation and application of metallic glass. (16)

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