Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY/JUNE 2014

(Regulation 2013)

CIVIL ENGINEERING

Second Semester

U13PHT201: Materials Science

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. When the sound intensity is doubled, the increase in the acoustic intensity level is
   a) 3.01 dB b) 2.03 dB
   c) 0 dB d) 1.03 dB
2. If 10 m^2 of a carpet absorbs the same amount of sound energy as absorbed by 1 $m^2$of an open window, then the absorption coefficient of the carpet is ----------.
3. Mobility of electrons in a metal is defined as
   a) The random velocity of electrons b) The drift velocity of electrons per unit applied electric field
   c) The steady velocity of the electrons d) Inverse of conductivity
4. The exclusion of magnetic lines of force through the superconductor is known as ---------- ------ effect
5. In an n-type semiconductor the Fermi level lies
   a) Just above the top of the valence band b) Just below the bottom of the conduction band
   c) In the middle of the forbidden gap d) Above the conduction band
6. In terms of Hall coefficient and electrical conductivity, the Hall mobility is given as ----------
7. The magnetic susceptibility of a diamagnetic material is
   a) Small and positive b) Small and negative
   c) Large and positive d) Large and negative
8. Dipole moment per unit volume is known as----------.
9. A method to prepare nano particles by top-down processes is
   a) Chemical vapour deposition b) Ball milling
   c) Sol-gel d) Electro deposition
10. The method of preparation of metallic glasses is known as ----------

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Prove that 26% change in intensity alters the sound intensity level by 1 dB.
12. What is meant by echelon effect?
13. Give any two drawbacks of classical free electron theory of metals.
14. What is isotope effect of superconductors?
15. What are acceptor and donor energy levels?
16. What is meant by effective mass of an electron?
17. Explain the storage of magnetic data in floppydiscs.
18. Explain the term dielectric breakdown.
19. What are the structures of carbon nano tubes?
20. Give the advantages of using metallic glasses as transformer core.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. (i) Discuss in detail the theory and applications of Shape Memory Alloys. (10)
    (ii) Explain the properties of NiTi alloy. (4)

22. a) What is reverberation time and derive Sabines formula for the same.

(OR)

b) (i) What is absorption co-efficient of a material and explain a method to determine the absorption co-efficient of a material. (7)
   (ii) Explain the various factors affecting the acoustics of building and give their remedies. (7)

23. a) (i) Explain the postulates of classical free electron theory of metals and also derive an expression for its electrical conductivity. (10)
    (ii) A metallic wire has a resistivity of 1.42 x 10^{-8} ohm-m. For an electric field of 0.14 V/m, find average drift velocity and mean collision time, assuming that there are 6 x 10^{28}electrons/m^3. (4)

(OR)

b) (i) What are the effect of current and magnetic field on superconductors and also explain type I and type II superconductors with examples (10)
   (ii) Explain high temperature superconductors with examples. (4)

24. a) (i) Derive the expression for the density of electrons in the conduction band of an n-type semiconductor and also explain its dependence on impurity and temperature. (10)

(ii) The intrinsic carrier density is $1.5 \times 10^{16}/m^3$ and if the electron and hole mobilities are 0.13 and 0.05 m^2/Vs, calculate its resistivity. (4)

(OR)

b) (i) What is Hall effect? Derive the expression for hall coefficient for n-type and p-type semiconductors and also derive hall coefficient in terms of Hall voltage. (10)

(ii) The Hall coefficient of a specimen is 3.66×10^{-4} m^3/C. The resistivity of the specimen is 8.93×10^{-3} ohm-m. Find the mobility and density of the charge carriers. (4)

25. a) (i) Distinguish between dia, para and ferro magnetic materials (7)

(ii) Explain hysteresis of ferromagnetism based on domain theory. (7)

(OR)

b) Discuss in detail the different polarization mechanism of a dielectric material and also explain its dependence on temperature and frequency.

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