Register Number: …...……….

B.E DEGREE EXAMINATIONS: DEC 2014

(Regulation 2013)

Second Semester

CIVIL ENGINEERING

U13PHT201 :Materials Science

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Phon is the unit for
   a) loudness level   b) intensity
   c) absorption coefficient   d) intensity level

2. Absorption coefficient of a material is the ratio of the sound energy ----------- to the sound energy incident.

3. At T = 0 K, the energy levels located above E_F (when $E > E_F$) are
   a) 100 % filled   b) 0 % filled
   c) 50 % filled   d) 75 % filled

4. Superconductivity has fewer applications because of the requirement of --------------- temperature.

5. Width of ---------------------- bands decreases with increase in the binding energy of electrons.

6. The direction of Hall voltage is
   a) parallel to electric field   b) perpendicular to magnetic field
   c) perpendicular to both electric and magnetic fields   d) parallel to both electric and magnetic fields

7. Diamagnetic substances when placed in a magnetic field are
   a) weakly attracted   b) neither attracted nor repelled
   c) strongly attracted   d) repelled

8. ------------- polarizability is strongly temperature dependent.

9. The two stable phases present in shape memory alloys are
   a) martensite and austenite   b) ferrite and cementite
   c) pearlite and troosite   d) sorbite and bainite

10. Carbon nanotubes have ---------- strength 20 times higher than steel.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Distinguish between loudness and intensity of sound.

12. A music hall has a volume of 7500 m^3. The total absorption in the hall is 800 O.W.U. Estimate the reverberation time of that hall.

13. Mention any two merits of classical free electron theory.

14. Calculate the critical current for a wire of lead having radius 0.5 mm and critical magnetic field of 4.276 X 10^4 A/m.

15. How can one measure the energy gap of an intrinsic semiconductor experimentally?

16. The Hall coefficient of certain silicon specimen is found to be -7.35 X 10^{-5} m^3C^{-1} from 100 to 400 K. Determine the nature of the semiconductor and charge carrier density.

17. Differentiate between ferro and antiferro magnetic materials.

18. List any two applications of ferroelectric materials.

19. Write down any two advantages of shape memory alloys.

20. Point out the merits of synthesis of nanomaterials by chemical vapour deposition technique.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. Discuss the various properties and applications of metallic glasses.

22. a) Derive expressions for growth and decay of sound energy density inside a hall and hence Sabine's formula for reverberation time of the hall.

(OR)

b) Explain the various factors affecting the architectural acoustics of buildings and their remedies.

23. a) (i) Derive an expression for density of energy states. (10)

(ii) For copper, the relaxation time is 10^{-4} s and the free electron density is (4) 2 X 10^{28}/m^3. Calculate its electrical conductivity.

(OR)

b) (i) Elaborate on the potential applications of superconductors. (10)

(ii) Write a brief note on Type-I superconductors. (4)

24. a) Show mathematically the Fermi level is located exactly at the mid-point of forbidden energy gap in the case of an intrinsic semiconductor.

(OR)

b) (i) With necessary theory, show that for n-type semiconductor the Hall coefficient is – 1/ne. (10)

(ii) The electron and hole mobility in silicon are 0.135 m^2/Vs and 0.048 m^2/Vs respectively at room temperature. If the carrier concentration is 1.5×10^{16} m^{-3}, calculate the resistivity. (4)

25. a) (i) Differentiate between hard and soft magnetic materials. (10)

(ii) Point out the special features of magnetic bubble memory. (4)

(OR)

b) (i) What is electronic polarization? Deduce a mathematical expression for electronic polarisability with necessary theory. (10)

(ii) Write short notes on temperature effects on the polarization. (4)

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