KUMARAGURU college of technology
character is life

Register Number: ……..

B.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Second Semester

CIVIL ENGINEERING

PHY102: Materials Science

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. What is the unit for electrical resistivity?

(a) $\Omega^{-1}m^{-1}$ (b)Ω m (c)$\Omega^{2}m$ (d) $Wm^{-1}k^{-1}$

2. Identify the value of $T_C$for high temperature super conductor

(a)T_C>10K (b) T_C>30K (c) T_C<30K (d) T_C =0K

3.Which one is the example of direct band gap semiconductor

(a) GaP (b)Si (c)Ge (d) P

4. Select the Fermi energy level of p-type semiconductor

(a) $E_F= (E_V+E_a)/2$ (b) $E_F= (E_V-E_a)/2$ (c) $E_F= (E_V+E_d)/2$ (d)$E_F=(E_V-E_d)/2$

5.What is the relationship between permeability &susceptibility

(a) $\mu_r=1+\chi_m$ (b)$\mu_r =1+ \varepsilon_0$ (c)$\mu_r =\chi_m-1$ (d) $\mu_r = \varepsilon_0-1$

6. Find the frequency range of space charge polarisation

(a) above 10^{12}Hz (b)above 10^{5}Hz (c)below 10^{2}Hz (d) up to 10^{15}Hz

7. Choose the crystalline structure of austenite

(a) Trigonal (b)Triclinic (c)Cubic (d) Monoclinic

8.What approach is involved in plasma arching method

(a) Top up (b) Bottom down (c) Top down (d)Bottom up

9.Choose the process in which heat is transmitted from hotter to colder end bythe actual movement of heated particles

(a) Conduction (b) Convection (c) Radiation (d) Diffusion

10.Determine the expression for the coefficient of thermal conductivity

(a) $\frac{KA^2(\theta_2-\theta_1)x}{t}$ (b) $\frac{KA(\theta_1-\theta_2)t}{x^3}$ (c) $\frac{KA(\theta_1-\theta_2)t}{x}$ (d) $\frac{KA(\theta_1-\theta_2)x}{t}$

Answer ALL Questions:-

PART B (10x2=20 Marks)

11. What is the successbehind classical free electron theory?
12. Prove that the susceptibility of super conductor is negative and relative permeability is zero.
13. Compare elemental & compound semiconductor.
14. Define donors & acceptors.
15. What is Curie temperature?
16. Superconducting tin has a critical temperature of 3.7K at zero magnetic field and acritical field of 0.0306Tesla at 0K. Find the critical field at 2K.
17. List out any four applications of nano materials.
18. How nano materials are formed using ball milling technique.
19. Define thermal diffusivity.
20. What is meant by temperature gradient?

PARTC(5x14=70 Marks)

21. a) Deduct a mathematical expression for electrical conductivity of a conducting material and obtain Wiedemann -Franz law.

(OR)

b) (i) Discuss type I & type II super conductors. (7)

(ii) Briefly explain Cryotron and MAGLEV. (7)

22. a) Assuming Fermi -Dirac statistics, derive an expression for the density of electrons and holes in an intrinsic semiconductor.

(OR)

b) What is Hall effect? Show that for a p-type semiconductor the Hall coefficient is $R_H = (1/\rho e)$and with neat sketch, explain the experimental set up to measure the Hall Voltage.(2+5+7)

23.a) (i)Explain the hysteresis curveon the basis of ferro magnetic domain theory. (7)

(ii) Classify hard and softmagnetic materials on the basis of hysteresis loop. (7)

(OR)

b) (i) Discuss in detail the various dielectric breakdown mechanisms. (10)

(ii) The dielectric constant of Helium gas at NTP is 1.0000684.Calculate the electronic polarizability of He atoms if the gas contains 2.7×10^{25}atoms/m^3 and hence evaluatethe radius of the helium atom.($\varepsilon_0 = 8.85\times10^{-12}$F/m). (4)

24. a) (i) What are metallic glasses? (2)

(ii) How are they prepared? (5)

(iii) Explain their properties ndapplications. (7)

(OR)

b) Explain with necessary diagrams the synthesis of nano materials using the following methods.

(i) Chemical vapour deposition. (7)

(ii) Sol-gel method. (7)

25. a) Derive the expression for one dimensional flow of heat and solve it under steady state condition.

(OR)

b) Describe the experimental method used to determine the thermal conductivity of rubber based on the principle of radial flow of heat.

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