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Question Paper Code: 52003

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

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 Wiedemann-franz Law.
2. The Fermi energy of Silver is 5.51 eV. What is the average energy of a free electron at 0 K?
3. What is the need for extrinsic semiconductors?
4. Draw the Fermi level in an intrinsic semiconductor at $T=0$ K & $T \neq 0$ K.
5. Define Bohr magneton.
6. What is Meissner effect?
7. Define dielectric constant.
8. What is dielectric loss?
9. State some applications of shape memory alloys.
10. What is shape memory effect?

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for electron concentration in conductor using Fermi distribution function. Use it to find the Fermi energy of electrons at absolute zero. (16)

Or

(b) Derive an expression for density of energy states and hence obtain the expression for carrier concentration in metals. (16)

12. (a) Obtain an expression for the intrinsic charge density of an intrinsic semiconductor. (16)

Or

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

13. (a) Explain the domain theory of ferromagnetism. Using that theory, explain the formation of hysteresis in ferromagnetic materials. (16)

Or

(b) (i) Discuss the different types of super conductors. (8)

(ii) Describe the BCS theory of super conductivity. (8)

14. (a) Define Local field in a dielectric. Obtain an expression for the internal field in dielectric and hence Deduce Clausius-Mosotti equations. (16)

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) What are nano materials? How nano materials are synthesised by sol gel and ball milling technique. (16)

Or

(b) Discuss different types of techniques using synthesis of nano-phase materials and give its applications. (16)