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Question Paper Code: 32003

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

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. Write short note on thermal conductivity.
2. Find the Fermi function value, if the energy of a state ' E ' is equal to Fermi energy ' E_F '.
3. Define intrinsic semiconductor and give an example.
4. What are compound semiconductors? Give examples.
5. What is Bohr magnetron? Give its value.
6. What is Meissner effect in superconductors?
7. Define dielectric constant.
8. Give any two applications of ferroelectric materials.
9. State some applications of shape memory alloys.
10. Name the three structures of carbon nano tubes.

PART - B (5 x 16 = 80 Marks)

11. (a) What is Fermi distribution function? Derive an expression for the effect of temperature on Fermi distribution function. (16)

Or

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

12. (a) (i) Derive an expression for the carrier concentration in p-type semiconductor. (10)
(ii) Discuss the variation of Fermi level of p-type semiconductor with temperature and impurity concentration. (6)

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) (i) What is polarization? Derive an expression for the polarisability in electronic polarization. (10)
(ii) Explain the dependency of polarization on frequency and temperature. (6)

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)