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<b>Question Paper Code : 86613</b>
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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Second Semester

Civil Engineering

HS 1152 — ENGINEERING PHYSICS – II

(Common to all branches)

(Regulations 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the drawbacks of classical free electron theory?
2. Define Fermi energy of free electrons.
3. The hole concentration of a semiconductor is increased by 5%. Estimate the percentage change in electron concentration.
4. What are compound semiconductors? Give examples.
5. How are different magnetic materials classified?
6. Define superconductivity and super conducting transition temperature.
7. What are Ferro Electric Materials?
8. What is the dependence of Ionic and Orientation Polarization with Temperature?
9. What is meant by superplasticity?
10. Give any two applications of metallic glasses.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for thermal conductivity of a metal. (8)  
(ii) Derive an expression for the Density of Energy States of a metal. (8)

Or

- (b) (i) Derive the expression for Electrical Conductivity of metals. (6)  
(ii) Free electron density of Aluminium is  $18.10 \times 10^{28} \text{ m}^{-3}$ . Calculate its Fermi energy in electron volt at 0 K. Given Planck's constant is  $6.62 \times 10^{-34} \text{ JS}$  and mass of electron is  $9.0 \times 10^{-31} \text{ kg}$ . (4)  
(iii) Explain Fermi Dirac Distribution function and how does it vary with temperature. (6)
12. (a) Derive expressions for the electron and hole concentrations of a semiconductor, and hence deduce an expression for the Fermi energy of an intrinsic semiconductor. (16)

Or

- (b) What is Hall effect? Discuss the theory and experimental procedure to obtain the Hall coefficient of a material. Also discuss the uses of Hall coefficient. (2 + 10 + 4)
13. (a) (i) Explain the domain theory of ferromagnetism. Using that how will you explain the properties of ferromagnetic materials? (8)  
(ii) Explain with neat sketch the process of magnetic recording and reading of data. (8)

Or

- (b) (i) Distinguish type I and type II superconductors. Write a note on High Tc superconductors. (10)  
(ii) What is Squid? Explain its functioning. (6)
14. (a) (i) Define Orientation Polarization. (2)  
(ii) Derive an expression for the electronic polarization in dielectric materials. (8)  
(iii) Describe the frequency dependence of Polarization in dielectric materials. (6)

Or

- (b) (i) Give any two uses of Ferro Electric Materials. (2)  
(ii) Differentiate dielectric loss and dielectric breakdown. Give the various reasons for dielectric breakdown. (8)  
(iii) Deduce the expression for Clausius - Mossotti relation. (6)

15. (a) (i) Describe the preparation and properties of metallic glasses. (10)  
(ii) Write a short note on shape memory alloys. (6)

Or

- (b) (i) Describe any two methods for the production of nano materials. (8)  
(ii) Describe the properties and applications of carbon nano tubes. (8)

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