Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 61093

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Civil Engineering

PH 2161/PH 23/080040002 — 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. State Wiedemann-Franz law.

2. Calculate the conductivity of an intrinsic semiconductor if the mobilities of electrons and holes in it are 8.6×10^6 $m^2/v.s.$ and 1.7×10^6 $m^2/v.s.$ respectively. The electron and hole densities in the sample is $2.2 \times 10^{19}/m^3$.

3. Compared with Germanium, Silicon is widely used to manufacture the elemental device. Why?

4. Draw the graph for variation of Fermi level with temperature in p-type semiconductor.

5. What is Bohr magneton?

6. What are the advantages of SQUID?

7. Calculate the polarization produced in a dielectric medium of dielectric constant 6 when it is subjected to an electric field of 100 V/m (Given $\varepsilon_0 = 8.85 \times 10^{-12} Fm^{-1}$).

8. Define electric breakdown and dielectric strength.

9. What is shape memory effect?

10. What are the different crystalline forms of carbon?

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Derive the expressions for electrical and thermal conductivity based on classical free electron theory. (10)

(ii) Calculate the electrical and thermal conductivities for a metal with a relaxation time of 10^{-14} second at 300 K. Also calculate the Lorentz number using the above result. [Density of electrons — $6 \times 10^{28}/m^3$] (6)

Or

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

(ii) Give an account on Fermi-Dirac distribution function. Draw a graph showing its variation with energy at different temperature and discuss it. (6)

12. (a) Explain the terms conduction band and valence band of an intrinsic semiconductor with a diagram. Derive an expression for density of electrons in conduction band.

Or

(b) What is Hall Effect? Derive an expression for Hall coefficient. Describe an experiment for the measurement of the Hall coefficient and mention its application.

13. (a) (i) A paramagnetic material has a magnetic field intensity of $10^4\ A/m$. If the susceptibility of the material at room temperature is 3.7×10^{-3}, calculate the magnetization and flux density of the material. (4)

(ii) Describe the structure of ferrites. (4)

(iii) Mention the different properties of ferrites. (4)

(iv) What are the applications of ferrites? (4)

Or

(b) (i) Prove that susceptibility of superconductor is –1 and relative permeability is zero. (4)

(ii) Briefly explain the following :

(1) Cryotron (4)

(2) Magnetic Levitation (4)

(3) High Temperature Super Conductors. (4)

14. (a) (i) Describe in detail the different types of polarization present in dielectrics. (10)

(ii) Explain the variation of polarization with frequency and temperature. (6)

Or

(b) (i) Define local field and derive Clausius Mosotti relation. (10)

(ii) Discuss the applications of dielectric materials. (6)

15. (a) (i) What are Shape Memory Alloys (SMAs)? Describe the characteristics of shape memory alloys. (8)

(ii) List out any four applications of shape memory alloys. (4)

(iii) Mention any two advantages and two disadvantages of SMAs. (4)

Or

(b) (i) What are nanoparticles? Explain how nanoparticles can be produced using ball-milling technique. (2 + 6)

(ii) Describe the mechanical, chemical and magnetic properties of nanoparticles. (8)

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