Reg. No. :

Question Paper Code : 92074

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Second Semester

Civil Engineering

PH 6251 – ENGINEERING PHYSICS – II

(Common to all Branches)

(Regulation 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Draw qualitatively Fermi-Dirac distribution function at T = 0 K and at a temperature T > 0 K.
2. Calculate the drift velocity of conduction electrons in a copper wire of cross-sectional area 5 mm^2 carrying a current of 5 A. Conduction electron density in copper is $8.5 \times 10^{28}/m^3$.
3. What are elemental semiconductors and compound semiconductors ?
4. With increase of temperature, the conductivity of a semiconductor increases. Why ?
5. What are the properties required for a material to be suitable for making electromagnet ? Give examples.
6. What is London penetration depth ?
7. Define the terms dielectric susceptibility and polarizability.
8. In what way do ferroelectric materials differ from ordinary dielectric ?
9. What are shape memory alloys ?
10. Mention any four methods to produce nano materials.

PART – B (5×16=80 Marks)

11. a) i) On the basis of free electron theory, derive an expression for electrical conductivity of metals. (12)

ii) What are the drawbacks of classical free electron theory of metals ? (4)

(OR)

b) i) Explain the concept of density of energy states. Derive an expression of density of energy states . (12)

ii) Find the expression for carrier concentration in metals. (4)

12. a) Explain the electrical properties of an intrinsic semiconductor based on band theory. Derive an expression for electron density in the conduction band and explain how it changes with temperature. (16)

(OR)

b) Derive an expression for Fermi energy level in a n-type semiconductor. Discuss the variation the Fermi level with temperature along with graphical representation and show that n-type semiconductor behaves as an intrinsic semiconductor at high temperature. (16)

13. a) i) Explain the classification of materials based on magnetic behaviour with examples. (12)

ii) What type of magnetic materials are used in magnetic tapes for data storage ? (4)

(OR)

b) i) Explain the terms critical temperature, critical magnetic field and critical current density and their significance for superconductors. (8)

ii) Explain the interaction of type-I and type-II superconductors with external magnetic field. (8)

14. a) i) Explain the mechanism of polarization in ionic crystals and polar materials. **(12)**

ii) The atomic weight and density of sulphur are 32 and 2080 kgm^{-3} respectively. The electronic polarizability of sulphur atom is 3.28×10^{-40} F m^2. Solid sulphur has cubical symmetry. Calculate its dielectric constant. **(4)**

(OR)

b) i) Explain in detail the use of dielectric materials in capacitors and transformer cores. **(12)**

ii) Explain dielectric loss and find an expression for dielectric power loss. **(4)**

15. a) What are metallic glasses ? How are they prepared ? Explain their use as transformer core materials. **(16)**

(OR)

b) Explain biomaterial and its applications in the field of medicine. **(16)**

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