Reg. No. :

Question Paper Code : X61085

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
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. Copper has electrical conductivity at 300 K as 6.40×10^7 mho m^{-1}. Calculate the thermal conductivity of copper.
2. Define density of states. What is its use ?
3. Electrical conductivity decreases in metals when temperature increases whereas in semiconductor, conductivity increase. Why ?
4. Distinguish between direct band gap and indirect band gap semiconductors.
5. Every magnetic material has an intrinsic diamagnetism. Explain.
6. State the use of magnetic levitation.
7. Define oriental polarization.
8. What are dielectric losses ?
9. Distinguish between 'ordinary metal' and 'metallic glass'.
10. What is meant by pulsed laser deposition ?

PART – B **(5×16=80 Marks)**

11. a) Define electrical conductivity. Obtain an expression for electrical conductivity by free electron theory.

(OR)

b) Based on Fermi-Dirac statistics state the nature of Fermi distribution function. How does it vary with temperature ?

12. a) Obtain an expression for carrier concentration of charges in an n-type semiconductor. Describe the variations of Fermi-level with Temp and impurity concentration. **(12+4)**

(OR)

b) i) Define Hall effect. Derive the Hall co-efficient. Any four applications of Hall effect. **(2+6+4)**

ii) An n-type Germanium sample has a donar density of $10^{21}/m^3$. It is arranged in a Hall experiment having B = 0.5 W/m^2 and J = 500 A/m^2. Find The Hall voltage if the sample is 3 mm thick. **(4)**

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) Explain electronic polarization in atoms and obtain an expression for electronic polarizability in terms of the radius of atoms. **(2+8)**

ii) If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is 4.3×10^{-8} C/m^2, calculate the relative permittivity of NaCl. Take the value $\varepsilon_0 = 8.86 \times 10^{-12}$ Fm^{-1}. **(2)**

iii) The number of atoms in a volume of one cubic meter of hydrogen gas is 9.8×10^{26}. The radius of hydrogen atom is 0.53 Å. Calculate the polarizability and relative permittivity. **(4)**

(OR)

b) i) What is meant by 'internal field' ? Obtain an expression for internal field using Lorentz method. **(2+6)**

ii) A solid contains 5×10^{28} identical atoms per m^2 each with a polarizability of 2×10^{-40} Fm^2. Assuming that internal field is given by the Lorentz relation, calculate the ratio of internal field to the applied field $\varepsilon_0 = 8.854 \times 10^{-12}$ Fm^{-1}. **(4)**

iii) The dielectric constant of water is 80. Is water a good dielectric ? Is it useful for energy storage in capacitors ? Justify your answer. **(4)**

15. a) i) Explain the Rapid quenching method for the preparation of metallic glasses and its properties. **(8)**

ii) Explain the theory of Shape Memory Effect. **(8)**

(OR)

b) i) Describe any two methods of production of nano materials. **(8)**

ii) Explain the different properties of nano materials. **(8)**

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