AKSHEYAA COLLEGE OF ENGINEERING
(Approved by the AICTE New Delhi & Affiliated to the Anna University Chennai)
(ISO 9001 : 2008 Certified)
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NAAC Accredited Institution

Department of Science and Humanities

Subject: Engineering Physics-II (Sub.Code: PH6251)

(Common to All Branches)

Important Part – A Questions

UNIT – 1: CONDUCTING MATERIALS

1. Define (i) Mobility (ii) Mean free path
2. What is meant by drift velocity? Give its formula.
3. What are the difference between drift velocity and thermal velocity of an electron?
4. What are the success and drawbacks of classical free electron theory?
5. Define (i) Relaxation time (ii) Collision time
6. Distinguish between relaxation time and collision time?
7. Define electrical conductivity and thermal conductivity of metals.
8. Distinguish between electrical conductivity and thermal conductivity.
9. State Widemann – Franz law. Give the value of Lorentz number and state whether it holds good for all metals and at all temperatures?
10. What are the sources of resistance in metals?
11. Mention any two important features of quantum free electron theory of metals.
12. Define Fermi energy level and Fermi energy with its importance.
13. What is meant by Fermi – Dirac distribution function? Give its importance.
14. How the Fermi function varies with temperature? (OR) Draw the Fermi distribution curve at 0K and at any temperature.
15. Define density of states and state its importance.

UNIT – 2: SEMICONDUCTING MATERIALS

16. State the properties of semiconductor?
17. What are elemental semiconductors and compound semiconductors? Give examples.
18. Compare elemental and compound semiconductors. (or) What are the differences between indirect band gap semiconductor and direct band gap semiconductor?
19. What are the differences between intrinsic and extrinsic semiconductor.
20. Give the expression for Fermi energy of an intrinsic semiconductor and extrinsic semiconductor at 0K.
21. Compare n-type and p-type semiconductors.
22. Show the variation of Fermi level with temperature in the case of n-type and p-type semiconductor for high and low doping levels.
23. What happens when the temperature increases in the case of semiconductor and conductor? (or)
    With increase of temperature the conductivity of semi conductors increases while for metals decreases. Give reasons?

24. Mention any four advantages of semiconducting materials.
25. Why do we prefer silicon for transistors and GaAs for laser diodes?
26. What are the applications of Hall Effect?
27. Define donars and acceptors and give its ionization energy.
28. What is meant by Hall Effect, Hall voltage and Hall coefficient?
29. How can you distinguish p-type and n-type semiconductors using Hall Effect?

UNIT – 3: MAGNETIC AND SUPERCONDUCTING MATERIALS

30. Explain the phenomenon of superconductivity.
31. Explain "Meissner Effect" (or) Will the superconductor exhibit the property of diamagnetism? Explain.
32. Define (i) Isotope effect (ii) Persistant current
33. Mention any four properties that changes and remain constant in superconductor.
34. Define critical temperature (or) transition temperature. Give its significance.
35. What is the condition for the material to behave as a superconductor?
36. What are high temperature superconductors? Give examples.
37. Define (i) Cooper pairs (ii) Coherence length.
38. Give any two applications of superconductors in engineering and medical field.
39. What is the principal of magnetic levitation?
40. Define (i) Bohr Magneton, and (ii) Energy product.

UNIT – 4 : DIELECTRIC MATERIALS

41. What are dielectric materials? Give its properties.
42. What is meant by polarization in dielectrics (or) Define electric polarization?
43. Mention any two active and passive dielectrics? Give examples.
44. Define Dielectric constant.
45. What are the various polarization mechanisms in dielectrics?
46. Define (i) Electronic polarization (ii) Ionic polarization
47. What is meant by orientation and space-charge polarization?
48. What are differences between polar and non polar dielectrics?
49. What is meant by internal field in dielectrics?
50. Define dielectric loss and loss tangent. Why it occurs?
51. What is meant by dielectric breakdown and dielectric strength?
52. Mention the various dielectric breakdown mechanisms.
53. What are the requirements of good insulating materials?
54. What is the effect of temperature on polarization?
55. What is meant by Ferro electricity? List any two properties and applications.

UNIT – 5: ADVANCED ENGINEERING MATERIALS

56. What are the metallic glasses?
57. What is meant by glass transition temperature?
58. What are the types of metallic glasses? Give example.
59. Explain the advantage of metallic glasses as core in transformers
60. Mention any four properties of metallic glasses.
61. Mention some application of metallic glasses.

62. What is meant by shape memory alloys?
63. What are the types of shape memory alloys? Explain.
64. What is transformation temperature?
65. What do you understand by Martensite and Austensite phases?
66. What is meant by shape memory effect?
67. Define (i) Pseudo – Elasticity (ii) Super-Elasticity
68. What are the properties of Ni Ti alloy?
69. What are the advantages and disadvantages of SMA?
70. Give some application of SMA.
71. What are nano materials? Give examples.
72. Write some properties and applications of nano materials.
73. What are Bioimaterials?
74. Define (i) Birefringence (ii) Optical Kerr effect.
75. List out some uses and applications of Biomaterials.

Important Part – B Questions

UNIT – 1: CONDUCTING MATERIALS

1. Deduce a mathematical expression for electrical conductivity and thermal conductivity of a conducting material and hence obtain Wiedemann – Franz law and Lorentz number by classical theory.

2. Derive an expression for the density of states and based on that calculate the carrier concentration in metals. Also obtain a general expression for the Fermi energy of electrons in solids at zero degree Kelvin and show that at the same temperature the average energy of the electron is $(3/5)^{th}$ of the Fermi energy.

3. Explain Fermi Dirac distribution for electrons in a metal and discuss the effect of temperature on Fermi function.

UNIT – 2: SEMICONDUCTING MATERIALS

4. Obtain an expression for density of electrons in the conduction band of an N-type extrinsic semiconductor by assuming Fermi – Dirac distribution function? **(or)** Show that the density of electrons in conduction band is proportional to the square root of donor concentration.

5. Obtain an expression for density of holes in the valence band of P-type extrinsic semiconductor by assuming Fermi – Dirac distribution function? **(or)** Show that the density of holes in the valence band is proportional to the square root of acceptor concentration.

6. What is Hall Effect? Derive an expression of Hall co-efficient in a n-type and p-type semiconductor. Describe an experimental setup for the measurement of Hall co-efficient?

UNIT – 3: MAGNETIC AND SUPERCONDUCTING MATERIALS

7. (a) Discuss the properties of superconductors. (b) Compare Type-I and Type-II superconductors (or) Give the differences between soft and hard superconductors.

8. (a). What is meant by Hight Temperature Superconductors (HTS) and give Examples. Give and outline of BCS theory of superconductivity.
   (b). Write short notes on (i) Cryotron (ii) SQUID (iii) Magnetic Levitation.

UNIT – 4: DIELECTRIC MATERIALS

9. Discuss in detail the various polarization mechanisms involved in dielectrics?

10. What is meant by local field in dielectrics and how is it calculated for a cubic structure. Deduce the Clausius-Mossotti equation.

UNIT – 5: ADVANCED ENGINEERING MATERIALS

11. Describe the preparation, properties and applications of metallic glasses.

12. Discuss in detail the characteristics of Shape Memory Alloys (SMA) along with its properties and applications.

13. Describe the pulsed laser deposition technique and chemical vapour deposition technique to synthesis Nano-materials.

Good Luck