Question Paper Code	12995

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024
Second Semester

Electronics and Instrumentation Engineering
(Common to Instrumentation and Control Engineering)

20BSPH206 - PHYSICS FOR INSTRUMENTATION ENGINEERING

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

		Marks	K–Level	CO

1. The unit of electrical conductivity is   —   1   K1   CO1
   (a) mho/metre (b) ohm/metre (c) ohm/m^2 (d) mho/m^2

2. The ratio of the thermal conductivity to the electrical conductivity is directly proportional to the absolute temperature is called----   1   K1   CO1
   (a) Weber Fechner Law   (b) Weiss's law
   (c) Wiedemann-Franz law   (d) Ohm's law

3. Energy of the particle in 1 Dimension box is ----   1   K1   CO1
   (a) $E=n^2h^2/8ma^2$ (b) $E=n^2h^2/ma^2$ (c) $E=2n^2h^2/8ma^2$ (d) $E=8n^2h^2/2ma^2$

4. Which among the following is the most commonly used semiconductor?   1   K1   CO2
   (a) Silicon   (b) Carbon (c) Germanium (d) Sulphur

5. What is the random motion of free electrons and holes due to thermal agitation called?   1   K1   CO2
   (a) Pressure   (b) Diffusion (c) Ionization   (d) None of the above

6. Hall coefficient is n-type semiconductor is given by ---------   1   K2   CO2
   (a) $RH = -neJ$ (b) $RH = 1/ne$ (c) $RH = -1/Jne$ (d) $RH = -1/ne$

7. In superconductivity, the conductivity of a material becomes -----   1   K1   CO3
   (a) Zero   (b) Finite   (c) Infinite   (d) None of the above

8. The superconducting state is perfectly _____ in nature.   1   K1   CO3
   (a) Diamagnetic   (b) Paramagnetic   (c) Ferromagnetic   (d) Ferromagnetic

9. The core and coil of a cryotron are prepared with .... superconducting material.   1   K2   CO3
   (a) Same   (b) Different   (c) Both a & b   (d) None

10. The magnetic dipole moment of a magnetic dipole is given by the formula _____.   1   K1   CO4
    (a) $M = m \times 2I$ (b) $M = m + 2I$ (c) $M = m - 2I$ (d) $M = m / 2I$

11. In which of the following materials, susceptibility increases and then decreases with increase in temperature,   1   K2   CO4
    (a) Ferromagnetic material   (b) Antiferromagnetic material
    (c) Paramagnetic material   (d) Diamagnetic material

12. The core of a transformer for microwave frequency should be made of   1   K2   CO4
    (a) Ferrites (b) Iron (c) silicon (d)silicon carbide

13. Dielectric materials are basically ----   1   K1   CO5
    (a) Insulators (b) Semiconductors (c) Superconductor (d) conductors

14. The process of breakdown is accelerated by the presence of ____   1   K1   CO5
    (a) Impurity (b) Conduction (c) Humidity (d) Magnetic field

15. The four types of polarization are Electronic Polarization, Ionic Polarization, Space-charge polarization and _____   1   K2   CO5
    (a) Magnetic polarization   (b) Electric polarisation
    (c) Orientation polarization   (d) Potential polarization

16. The piezoelectric materials used for converting energy are called as _____   1   K1   CO5
    (a)Transition Devices (b) Converter (c) Dielectric (d) Transducer

17. The optical properties of liquid crystals depend on the direction of _____   1   K1   CO6
    (a) Air (b) Solid (c) Light (d) Water

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12995**

18. How are metallic glasses formed?   1   K1   CO6
    (a) By increasing the rate of heating   (b) By increasing the rate of cooling
    (c) By melting it   (d) By rapidly heating and then cooling slowly
19. What is the building block of carbon nanotubes?   1   K1   CO6
    (a) Mini tubes   (b) Lattice   (c) Unit Cell   (d) Graphene
20. A nanowire is a--------   1   K1   CO6
    (a) 1-D material   (b) 3-D material   (c) 2-D material   (d) 0-D material

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. Obtain the microscopic form of ohm's law.	2	K2	CO1
22. Define Fermi Distribution Function.	2	K1	CO1
23. Given an extrinsic semiconductor, how will you find whether it is n-type or p-type?	2	K2	CO2
24. Explain how n-type semiconductors are formed.	2	K2	CO2
25. What is superconductivity?	2	K1	CO3
26. Define critical temperature.	2	K1	CO3
27. What are magnetic domains?	2	K1	CO4
28. Iron has a relative permeability of 5000. Calculate its magnetic susceptibility.	2	K2	CO4
29. Define polarization in dielectrics.	2	K1	CO5
30. What are the types of metallic glasses?	2	K1	CO6

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31. a) Deduce mathematical expression for thermal conductivity of a conducting material.   10   K2   CO1

    OR

    b) Derive an expression for the effective mass of an electron moving energy bands of a solid.   10   K2   CO1

32. a) Derive an expression for density of holes in valence band for an intrinsic Semiconductor.   10   K2   CO2

    OR

    b) Derive an expression for the Hall voltage in terms of Hall coefficient for an n-type semiconductor.   10   K2   CO2

33. a) Explain briefly about the following phenomenon in superconductors.   10   K2   CO3
    (i) Effect of current   (ii) Josephson effect and its types

    OR

    b) Write a short note on high temperature -123 superconductors. Also discuss about their characteristics, preparation method and crystal structure.   10   K2   CO3

34. a) Bring out the differences between soft and hard magnetic materials.   10   K2   CO4

    OR

    b) Explain the dia, para and ferromagnetic materials based on magnetic moment/spin alignment.   10   K2   CO4

35. a) Obtain an expression for internal field expression using Lorentz method.   10   K2   CO5

    OR

    b) Explain how to determine the dielectric constant and dielectric loss of a solid using Schering bridge.   10   K2   CO5

36. a) Explain the theory and working of LCD.   10   K2   CO6

    OR

    b) Explain the properties and applications of nanomaterials.   10   K2   CO6

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