Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category ‘A’ by MHRD)
Re-accredited with ‘A++’ Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test II – April 2025
VI SEMESTER

Class : I PG **Time: 2 hours**
Major : Physics **Maximum Marks: 60**

23MPHC09 Advanced Condensed Matter Physics

Course Outcomes:
At the end of the course, students will:
1. Analyse free electron theory
2. Distinguish conductors and semiconductors on the basis of Band theory
3. Explain the effect of macroscopic electric field on dielectric material and learn about superconductivity
4. Describe about Dia and Para -magnetism in detail.
5. Discuss Ferro and Antiferro magnetism in detail

Part-A **6x1=6**
Choose the correct answer

1. The relation between electrical conductivity (σ_e) and mobility of electrons (μe) is CO2K3
 a. $\sigma_e = ne\mu_e$ b. $\sigma_e = ne/\mu_e$ c. $\sigma_e = e/n\mu_e$ d. $\sigma_e = ne/\mu_e$
2. Mobility is defined as the ______ acquired by the carriers per unit electric field CO2K1
 a. displacement b. velocity c. acceleration d. voltage
3. When the atoms and ions are acted upon individually with no mutual interaction between them, the effect is defined as CO4K1
 a. paramagnetism b. Diamagnetism c. ferromagnetism d. antiferromagnetism
4. The relation between magnetic moment per unit volume (M) and the applied field strength (H) is CO4K2
 a. $M = \mu H$ b. $\chi = M/H$ c. $\chi = MH$ d. $M = H/\chi 2$
5. The maximum value of spontaneous magnetization is CO5K2
 a. $Ng/J\mu_B$ b. $Ng\,J\,\mu_B$ c. $N/J\mu_B$ d. Ng/μ_B
6. For polycrystalline antiferromagnetic substance, the following characteristic property is maximum as a function of temperature CO5K2
 a. permeability b. permittivity c. susceptibility d. hysteresis loss

Part- B **3x6=18**
Answer ALL Questions
Each answer should not exceed 400 words or two pages

7. a. Explain temperature effects on carrier concentration CO2 K3
(or)
7. b. Explain about mobility of carriers CO2 K3
8.a. Discuss briefly on Curie temperature CO4K3
(or)
8.b. Discuss on Weiss theory CO4K3
9.a. Distinguish between hard and soft magnetic materials CO5K3
(or)
9.b. Explain about Magneto-optical effect CO5K2

Part-C **3x12=36**
Answer ALL questions
Each answer should not exceed 800 words or four pages

10. a. Arrive at the expression for carrier concentration in a 3D semiconductor material CO2 K3
(or)
10.b. Explain Hall effect. Describe the experimental set-up of Hall effect and arrive at the expression for Hall coefficient CO2 K3
11. a. Describe about Langevin theory of diamagnetism CO4K3
(or)
11.b. Discuss on quantum theory of Paramagnetism CO4K3
12. a. Describe about classical theory of ferromagnetism and ferromagnetic domains CO5K2
(or)
12.b. Discuss on molecular field theory of antiferromagnetism CO5K2

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Staff in-charge: Dr. N. S. Rajeswari