Semester: 4th
Subject: Solid State Physics
Branch: Physics
Course Type: CORE
Time: 3 Hours
Max. Marks: 80

Date of Exam: /......../20.....
Subject Code: PHH215-T
Session:
Course Nature: Hard
Program: B. Sc. (H)
Signature: HOD/Associate HOD:

Note: Part A is compulsory. Attempt any two questions from Part B and any two questions from Part C.

PART-A

Q.1 (a) Differentiate between polar and non polar dielectrics. (2)

(b) What happen to a dielectric when it is placed in an external electric field, explain briefly? (2)

(c) Differentiate between ferromagnetism and paramagnetism. (2)

(d) What do you mean by ferroelectric and piezoelectric materials? (2)

(e) What do you mean London penetration depth and cooper pair? (2)

(f) What was the need of Curie-Weiss law? Hence write down Curie-Weiss law for paramagnetic materials explaining each term. (2)

(g) An electron revolves around the nucleus in an orbit of radius 0.54 Å. The frequency of revolution is 6.5×10^{15} Hz. Determine the magnetic moment of the electron. (2)

(h) Distinguish between dia and para magnetic materials. (2)

(i) Paramagnetic sample of $FeCl_3$ has susceptibility of 3.5×10^{-3} at temperature 27°C. Determine the susceptibility of the sample at twice the temperature. (2)

(j) Give the two examples of high temperature superconductors. (2)

PART-B

Q. 2 Define the paramagnetic materials. Obtain an expression for paramagnetic susceptibility. How does paramagnetic susceptibility of a material vary with temperature? (15)

Q. 3 Discuss the Weiss theory of ferromagnetism. Show from the Langevin function that ferromagnets lose their spontaneous magnetism above the Curie temperature. (15)

Q. 4 Discuss the following terms in details:
(i) Ferrimagnetisms and anti-ferromagnetism (4, 4)
(ii) Magnetic Hysteresis (7)

PART-C

Q. 5 (i) Define three electric vectors *E*, *P* and *D*. Establish a relationship between them. (10)

(ii) Derive Calussius-Mossotti relation. (5)

Q. 6 Derive London equations and discuss how these equations explain persistent current and Meissner effect? (15)

Q.7 (i) Write the salient features of BCS theory. Describe briefly the formation of cooper pairs. (10)

(ii) With the help of suitable diagrams, differentiate between type 1 and type 2 superconductors. (5)

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