PG (CBCS) EVEN SEMESTER EXAMINATION, 2023

PHYSICS

4th Semester

Course No. : PHYCC - 404 B

(Condensed Matter Physics - II)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer five questions, taking one from each unit)

UNIT - I

1. (a) What is Bottymann Transport Equation? Derive Boltzmann Transport Equation where the collissions are absent. 2+5=7

   (b) Deduce the expression for thermal conductivity of metals using Boltzmann Transport Equation. 7

2. (a) What is Hall Effect? Derive an expression for Hall coefficient. 1+7=8

   (b) Write short notes on : 3+3=6
   (i) Magnetoresistance (ii) Viscosity

UNIT - II

3. (a) What are the approximations in tight binding method? What is the expression for energyof an electron in tight binding approximation. 3+3=6

   (b) Find an expression for energy band in case of a simple cubic solid in the tight binding method. 8

4. (a) Prove Hohenberg-Kohn theorem. 7

   (b) Write short note on : $2x3^{1}/_{2}=7$
   (i) Exchange energy correlation (ii) APW

UNIT - III

5. (a) What are the dielectric materials? Write down the Clausius Mosotti equation in dielectrics and explain briefly? 3+4=7

   (b) Give the classical theory of electronic polarization. 7

6. (a) Describe the phenomenon of polarization catastrophe in ferroelectric crystalline material. 6

   (b) Write short note on : 4+4=8
   (i) Cole - Cole plot (ii) Dielectric polarization

UNIT - IV

7. (a) What are the origins of magnetic moment in an atom? Explain them briefly. 6

   (b) Discuss Langevin's theory of paramagnetism and hence derive the relation between magnetization and Langavin function. 8

8. (a) State briefly the phenomenon of paramagnetic cooling. 6

   (b) Write short note on : 4+4=8
   (i) Diamagnetism (ii) Magnetic moment

UNIT - V

9. (a) Give the classical model of optical conductivity. 7

   (b) What are different kinds of luminescence processes. What is the difference between fluorescence and phosphorescence with an example of each. 5+2=7

10. (a) What are the Frenkel and Mott-Wannier excitons. 4+4=8

    (b) Write short note on : 3+3=6
    (i) Color centre (ii) Traps

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