Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 11

M.Sc (Physics) (2018 Batch)   (Sem.-3)
CONDENSED MATTER PHYSICS
Subject Code : MSPH531-18
M.Code : 76750

Time : 3 Hrs.   Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :
 1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
 2. **SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.**
 3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

 1.   **Write briefly :**

 (a) What is cohesive energy?

 (b) Write stiffness constants.

 (c) If the Debye's temperature of metal is 450K, Calculate the Debye's frequency.

 (d) Discuss the merits and demerits of Einstein's quantum theory of specific heat of solids.

 (e) How effective mass vary in Brillion zones?

 (f) What is Wigner seitz cells?

 (g) Show the position of fermi level in metal and intrinsic semiconductor.

 (h) What is the significance of relaxation time?

 (i) What are ferroelectric domains?

 (j) Discuss the temperature dependence on conductivity in semiconductor and metals.

SECTION-B

2. Assume the energy of two particles in the field of each other is $U(r) = (-\frac{a}{r}) + (\frac{b}{r^8})$, calculate the minimum distance at which the particles form a stable compound.

3. What is the physical significance of Kronig-Penny-model? Discuss various zone schemes.

4. Describe inelastic scattering of photons by phonons. Obtain an expression for frequency of phonons generated when a photon is scattered in elastically at an angle of θ.

5. Derive Boltzmann transport equation and hence obtain an expression for the viscosity for a gas having Maxwellian velocity distribution.

6. Obtain Clausius- Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule from the dielectric constants measurements?

7. Explain the difference between ionic and covalent type of bonding and what do you understand by Madelung constant?

8. Evaluate the temperature at which there is one percent probability that a state, with an energy 0.5eV above the fermi energy, will be occupied by an electron.

SECTION-C

9. Calculate the velocity of longitudinal wave in [111] direction of cubic crystals.

10. Discuss Einstein's theory of lattice specific heat of solids. Comment on the assumption and achievement of the theory.

11. A semiconducting crystal 12mm long, 5mm wide and 1mm thick, has a magnetic flux density of 0.5 weber/metre^2 applied from front to back perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be 37μV. Calculate the Hall coefficient and density of current carriers.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.