647510 **BSCsmsCC6020** **Seat No :_____**

B.Sc. Semester - 6 (*CBCS*) Examination
March/April -2020
STATISTICAL MECHANICS AND SOLID STATE PHYSICS(CORE)

Time: 2:30 Hours **Marks: 70**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

1(a) Answer the following question (any one). **(7)**

(1) Explain in detail classical Maxwell-Boltzmann distribution law.

(2) Derive the distribution law of Bose-Einstein statistics.

1(b) Answer the following question (any one). **(4)**

(1) Explain volume in phase space.

(2) Explain thermodynamical probability.

1(c) Answer the following question (any three). **(3)**

(1) ……. statistics is used in the case of distinguishable particles.

(2) Which statistics is used for photons?

(3) The minimum volume of cell in a phase space is ……..

(4) ……. formula gives the aprroximate values of ln n!

(5) The particles which obey Fermi-Dirac statistics are known as …….

2(a) Answer the *following* question (any one). **(7)**

(1) Explain in detail crystal lattice and lattice translation vector.

(2) Write a note on heat capacity of solids.

2(b) Answer the following question (any one). **(4)**

(1) Write a short note on metallic crystal.

(2) Explain Debye model.

2(c) Answer the following question (any three). **(3)**

(1) The substance which has regular internal structure is called …….

(2) A unit cell containing only one lattice is called …….. cell.

(3) Si is …….. type of crystal.

(4) A simple thermodynamic relation connecting C_p and C_v is C_p-C_v= …….

(5) The Debye model is valid for ……. wavelengths.

3(a) Answer the following question (any one). **(7)**

(1) Explain free electron gas in three dimensions.

(2) Write a note on Hall effect.Also define Hall voltage and Hall coefficient.

3(b) Answer the following question (any one). **(4)**

(1) Explain density of states in one dimension.

(2) Derive the Boltzmann equation.

3(c) Answer the following question (any three). **(3)**

(1) Hamiltoniam H= …… energy+ ……energy

(2) The energy of top-most filled level at 0^0K is known as ……. energy.

(3) Write the equation of Fermi wave vector for free electron gas in 3 dimensions.

(4) The Wiedemann-Franz ratio can be written as ……..

(5) At low temperatures the value of Lorentz number tends to ……..

4(a) Answer the following question (any one). **(7)**

(1) Explain insulators.

(2) Explain electron-hole carrier cocntration.

4(b) Answer the following question (any one). **(4)**

(1) Explain intrinsic semiconductors.

(2) Describe electrical conductivityof intrinsic semiconductors.

4(c) Answer the following question (any three). **(3)**

(1) The equation of Fermi-Dirac function is f(E)= …….

(2) Abesence of electron in semiconductor is called …….

(3) In P-type semiconductors …….. are minority charge carriers.

(4) Energy gap is also known as ……..gap.

(5) The semiconductor obtained by doping impurities in pure semiconductror is called ……semiconductor.

5(a) Answer the following question (any one). **(7)**

(1) Explain London's theory in detail.

(2) Explain Josephson effect.

5(b) Answer the following question (any one). **(4)**

(1) Explain influence of external agents on superconductivity.

(2) Explain the application of superconductivity.

5(c) Answer the following question (any three). **(3)**

(1) The transition temperature T_c of mercury is ……K.

(2) The lines of magnetic field are pushed out of superconductor material is called …… effect.

(3) The relation between critical magnetic field H_c and transition temperature T_c is H_c =……..

(4) There are ……. types of superconductors.

(5) λ_L is measure of …….. depth of the magnetic field in superconductor material.