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

B.Sc. Semester - 6 (*CBCS*) Examination
March/April -2019
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 Fermi-Dirac statistics.

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

(1) Explain on micro states and macro states.

(2) Give the comparision (any four) of MB, BE and FD statistics.

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

(1) Which statistics is used for elementry particles?

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

(3) Stirling equation is ln n!= ……

(4) In ……statistics the particles are distinguishable from each other.

(5) ……statistics is obeying Pauli exclusing principle.

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

(1) Explain in detail covalent crystal.

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

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

(1) Write a short note on simple cubic structure.

(2) Explain density of modes in one dimensional lattice.

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

(1) The substance which has no regular internal structure is called …….

(2) Lattice + Basis = ……..

(3) NaCl is …….. type of crystal.

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

(5) Debye considers the …… modes of a crystal as a hole.

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

(1) By considering a free electron gas in one dimension, evalute energy of the highest occupied level for case of N electron.

(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.

(2) Using the Sommerfield's theory derive the ratio of thermal conductivity to electrical conductivity.

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

(1) Write the equation of Fermi velocity for electron gas in three dimentions.

(2) Give the relation of Wiedemann and Franz law.

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

(4) What is the eigen value of momentum.

(5) Area under the curve of density state is give the value of …….. per unit olume.

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

(1) Write a note on electron-hole carrier concentration.

(2) Explain electrical conductivity and bonding in semiconductors.

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

(1) Explain semiconductors in short.

(2) Describe the effect of impurities on intrinsic semiconductors.

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

(1) The electrical resistivity of a semiconductors strongly dependent on …….

(2) The unit of energy gap (E_g) is ……

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

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

(5) The semiconductor in its pure form is called ……semiconductor.

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

(1) Explain thermodynamics of superconducting transiton.

(2) Explain London's theory in detail.

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

(1) Write a note on Meissner effect.

(2) Explain superconductivity in alloys and compounds.

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

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

(2) What is the relation between trasition temperature T_c and atomic mass M for the Superconductor?

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

(4) A superconductor exhibits a perfact …….magnetism.

(5) The ratio of critical field of small specimen and bulk specimen for superconductor is given by h_c/H_c= ……..

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