

B.Sc. Semester - 6 (CBCS) Examination

March/April-2024 (NEW COURSE)

Statistical Mechanics & Solid State Physics (Core (New))

Time: 2:30 Hours

Marks: 70

Instructions:

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

- Que.1(A) Answer the following questions. (any two out of three) (10)
1. Derive the distribution law of Fermi-Dirac statistics.
 2. Derive the general equation of volume in Phase Space.
 3. Derive the formula for Stirling's Approximation.
- Que.1(B) Answer the following questions. (any one out of two) (04)
1. Discuss Microstate and Macrostate.
 2. Give the classification of particles in statistical mechanics.
- Que.2(A) Answer the following questions. (any two out of three) (10)
1. Discuss in brief about Hexagonal Closed Packed Structure, and calculate its packing fraction.
 2. What are Miller indices? How they are calculated?
 3. What is Space Group? Discuss a few characteristics of the Space group.
- Que.2(B) Answer the following questions. (any one out of two) (04)
1. What are the main differences between crystalline and amorphous solids?
 2. Draw the below-given plane in a cubic crystal having Miller indices as.
[a] (1 1 0) [b] (1 1 1) [c] (0 0 1) [d] (1 0 0)
- Que.3(A) Answer the following questions. (any two out of three) (10)
1. Write a note on BCS Theory.
 2. Derive Gibbs free energy and Entropy of superconducting transition.
 3. Discuss the Meissner effect.
- Que.3(B) Answer the following questions. (any one out of two) (04)
1. The critical temperature of Mercury with an isotopic mass of 199.5 is 4.185 K. Calculate the critical temperature when its isotopic mass changes to 203.4.
 2. Discuss any four properties that change in the Superconducting transition.
- Que.4(A) Answer the following questions. (any two out of three) (10)
1. Write a note on the Metallic Bond.
 2. Discuss the characteristics of a Covalent bond.
 3. Discuss Cholesteric liquid crystal.
- Que.4(B) Answer the following questions. (any one out of two) (04)
1. Write the application of Liquid Crystal.
 2. Discuss in brief stability consideration and characteristics of Molecular Bonds.
- Que.5(A) Answer the following questions. (any two out of three) (10)
1. Discuss the Laser Evaporation Method and Chemical Vapor Deposition Method for the fabrication of Carbon Nanotubes.
 2. Write a note on Quantum Nanostructure.
 3. Write a note electronic structure of Metal Nanoclusters.
- Que.5(B) Answer the following questions. (any one out of two) (04)
1. Write a note on photo fragmentation and coulombic explosion of semiconducting nanoparticles.
 2. Write any four applications of carbon nanotubes.
