

B.Sc. Semester - 6 (CBCS) Examination**March/April-2023 (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.

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- Q.1(A) Answer the following questions. (Any Two) (10)**
1. Derive the distribution law of Bose - Einstein statistics.
 2. Explain: Fermi - Dirac distribution law.
 3. Explain Thermodynamic Probability and obtain the condition for maximum probability.
- Q.1(B) Answer the following questions. (Any One) (04)**
1. Derive the formula for Stirling's Approximation.
 2. Give the comparison (any four) of MB, BE and FD statistics.
- Q.2(A) Answer the following questions. (Any Two) (10)**
1. Describe the crystal structure of diamond and calculate the packing factor of Diamond. (No need to draw unit cell).
 2. What is single crystal and polycrystalline crystal? Explain symmetry consideration.
 3. Discuss Bravais Lattices in two dimensions (2-D).
- Q.2(B) Answer the following questions. (Any One) (04)**
1. What are the main differences between crystalline and amorphous solids?
 2. Calculate the Packing Factor of Face Centered Cubic crystal structure.
- Q.3(A) Answer the following questions. (Any Two) (10)**
1. Write a note on BCS Theory.
 2. Discuss Latent heat of transition, Specific Heat and Thermal conductivity of superconductor.
 3. Explain London's theory in detail.
- Q.3(B) Answer the following questions. (Any One) (04)**
1. Discuss the properties which do not change in superconducting transition.
 2. Write any four applications of superconductivity.
- Q.4(A) Answer the following questions. (Any Two) (10)**
1. Write a note on Metallic Bond.
 2. Discuss stability consideration and characteristics of Ionic Bond.
 3. Discuss thermotropic liquid crystal.
- Q.4(B) Answer the following questions. (Any One) (04)**
1. Write application of Liquid Crystal.
 2. Write any four Characteristics of Covalent Bond.
- Q.5(A) Answer the following questions. (Any Two) (10)**
1. Discuss vibrational and mechanical properties of carbon nanotubes.
 2. Write a note on Discovery and Structure of C_{60} .
 3. Write a note on the jellium model of nanoparticles.
- Q.5(B) Answer the following questions. (Any One) (04)**
1. Write a note on alkali doped C_{60} and Superconductivity in C_{60} .
 2. Write any four applications of carbon nanotubes.
