

B.Sc. Semester - 6 (CBCS) Examination**March/April-2026 (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 Bose - Einstein statistics.
 - (2) Derive the formula for Stirling's Approximation.
 - (3) Explain: Fermi - Dirac distribution law.
- Que.1(B) Answer the following questions (any one out of two) (04)
- (1) Explain: Thermodynamic Probability.
 - (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) Discuss Bravais Lattices in two dimensions (2-D).
- Que.2(B) Answer the following questions (any one out of two) (04)
- (1) Calculate the Packing Factor of Body Centered Cubic crystal structure.
 - (2) What are the main differences between crystalline and amorphous solids?
- Que.3(A) Answer the following questions (any two out of three) (10)
- (1) Write a note on BCS Theory.
 - (2) Discuss the Meissner effect.
 - (3) Write a note on influence of external agents on superconductivity.
- Que.3(B) Answer the following questions (any one out of two) (04)
- (1) Write any four applications of superconductivity.
 - (2) Discuss the properties which do not change in superconducting transition.
- Que.4(A) Answer the following questions (any two out of three) (10)
- (1) Discuss the Cholesteric liquid crystal.
 - (2) Write a note on Ionic Bond.
 - (3) Discuss the characteristics of a Covalent bond.
- Que.4(B) Answer the following questions (any one out of two) (04)
- (1) Discuss in brief stability consideration and characteristics of Molecular Bonds.
 - (2) Write the application of Liquid Crystal.
- Que.5(A) Answer the following questions (any two out of three) (10)
- (1) Write a note on Discovery and Structure of C_{60} .
 - (2) Write a note on Quantum Nanostructure.
 - (3) Write a note on the jellium model of nanoparticles.
- Que.5(B) Answer the following questions (any one out of two) (04)
- (1) Discuss inert gas clusters, superfluid clusters, and, molecular clusters.
 - (2) Write a note on photo fragmentation and coulombic explosion of semiconducting nanoparticles.
