

FACULTY OF SCIENCE**M.Sc. II-Semester Examination, May / June 2018****Subject: Physics & Applied Electronics
Paper- II
Statistical Mechanics****Time : 3 Hours****Max. Marks: 80****Note : Answer all questions from Part-A and Part-B. Each question carries 4 marks in Part-A and 12 marks in Part - B.****PART - A (8X4= 32 Marks)
(Short Answer Type)**

1. Explain the terms macrostates and microstates with examples.
2. Explain the quantization of phase space.
3. State and prove equipartition energy theorem.
4. What is the physical significance of partition function.
5. What is Bose-Einstein condensation? Explain.
6. Write a note on super fluidity.
7. Explain the Brownian motion.
8. What is a phase transition? Classify the phase transitions into various orders.

**PART - B (4x12=48 Marks)
(Essay Answer Type)**

9. (a) Derive the expression for the entropy of an ideal Boltzmann gas using micro canonical ensemble.

OR

- (b) Show that the density of points in the phase space is conserved.

10. (a) Derive Bose-Einstein distribution function and show that it reduces to the classical distribution for high temperatures and low concentrations.

OR

- (b) What is a grand partition function? Using this function calculate various thermodynamical quantities of an ideal gas.

11. (a) Show that electronic specific heat as a function of temperature has a peak like behaviour. Does the peak position depend on the degeneracy of the levels?

OR

- (b) Discuss the phase diagram of Helium. Explain why Helium can not be liquefied at ambient pressure. What are the unusual properties of He-II.

12. (a) What do you mean by mean square deviation fluctuations. Relate energy and concentration fluctuations to appropriate response functions.

OR

- (b) Show that the magnetic susceptibility of one dimensional Ising model Satisfies Curie-Law with a divergence at absolute zero.