M.Sc. DEGREE EXAMINATION,NOVEMBER 2018
II Year III Semester
Core Major -VIII
STATISTICAL MECHANICS

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. State third law of thermodynamics.
2. Why the discontinuous transition is also called a first order transition?
3. Define space phase.
4. Define the terms microstates and macrostates.
5. What do you understand by canonical and grand canonical ensembles?
6. What is the significance of partition function in statistical physics?
7. What is the difference between Bosons and Fermions?
8. Show that density matrix is diagonal in energy representation.
9. What is transport phenomena?
10. Write notes on mean free path.
11. What is the minimum size of phase space in classical and quantum mechanics?
12. Find the number of possible arrangements of three particles in two cells assuming the particles obey M.B statistics.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Explain the Ehrenfest's classifications of phase transitions.
14. Explain the statistical meaning of entropy.
15. Write a note on statistical ensembles.
16. What is Bose-Einstein condensation? Explain.
17. What is known as Ising model? Explain one dimensional Ising model.
18. A system consists of 5 particles arranged in two compartments. The first compartment is divided into 6 cells and the second into 8 cells. The cells are of equal size. Calculate the number of microstates in the macrostate (2,3), if the particles obey FD statistics.
19. Discuss Gibb's phase rule.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Discuss the Landau theory of phase transitions.
21. What is entropy of an ideal system? State and explain Gibb's paradox.
22. State and prove Liouville's theorem.
23. Derive the distribution law according to FD statistics and discuss the various properties of an ideal Fermi gas at high temperature.
24. What is Brownian motion? Discuss the Langevin's theory of translational Brownian motion.

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