LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

FIRST SEMESTER – NOVEMBER 2017

PH 1815 - STATISTICAL MECHANICS

Date: 07-11-2017   Dept. No.   Max. : 100 Marks
Time: 01:00-04:00

PART-A

Answer ALL questions   **(10x2=20 marks)**

1. Distinguish between μ-space and -space.
2. Define phase space.
3. What is mean by correct Boltzmann counting.
4. State equipartition theorem.
5. Distinguish between micro canonical and canonical ensemble.
6. Distinguish between fermions and bosons.
7. Define the term "Fermi energy"
8. What are phonons?
9. What is the importance of Chandrasekar limit.
10. Define mean square deviation.

PART-B

Answer any FOUR questions   **(4x7$\frac{1}{2}$=30 marks)**

11. Derive rotational partition function for diatomic molecule.

12. Obtain Maxwell Boltzmann distribution law.

13. Derive an expression for the magnetic susceptibility of a free electron gas

14. Discuss the lambda transition in liquid helium He^4

15. Discuss quantum hall effect.

16. Obtain an expression for the energy fluctuation in a canonical ensemble

PART-C

Answer any FOUR questions   **(4x12$\frac{1}{2}$=50 marks)**

17. State and Prove Liouville's theorem. Express the equation of motion of phase point using poisson bracket

18. Obtain the expression for the entropy of an ideal gas by the method of canonical ensemble

19. What is Bose-Einstein condensation? Show how a system of Bosons condenses when cooled below the critical temperature.

20. Calculate the pressure exerted by a FD gas of relativistic electrons in the ground state. Use the result to explain the existence of Chandrasekhar limit on the mass of a white dwarf

21. Derive the Boltzmann transport equation. Use it to find the distribution function in the absence of collisions.

22. Demonstrate that the state of two different ideal gases is more highly ordered when they are separated than when they are mixed.

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