C 4675 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2016

(CUCSS)

Physics

PHY 2C 07—STATISTICAL MECHANICS

(2012 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries a weightage of 1.

1. Define micro canonical ensemble.
2. Explain degenerate state and statistical weight factor.
3. What is the difference between Bose particles and Fermi particles with respect to their spin and wave function ?
4. Define density matrix.
5. Draw the phase diagram for a particle free to move in one dimension.
6. What is grand partition function ?
7. What is the thermodynamic meaning of Fermi energy ?
8. Explain Bose-Einstein condensation.
9. Explain Gibbs paradox.
10. Give the statistical definition of entropy.
11. What is the relation between fugacity and q potential ?
12. Why the electrons in a metal do not contribute to its specific heat at room temperature ?

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*
Each question carries a weightage of 6.

13. Derive Liouville's theorem and explain its consequences.

Turn over

14. Explain the quantum mechanical ensemble theory. Explain density matrix.

15. Describe the thermodynamic behaviour of an ideal Bose gas.

16. Explain Pauli paramagnetism and obtain the expression for susceptibility.

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions.*
Each question carries a weightage of 3.

17. Calculate the number of micro-states for four particles having a total energy of 6 E, the energy levels are equally spaced.

18. Atomic weight of Li is 6.94 and its density is 530 kg/m^3. Calculate the Fermi energy and Fermi temperature of electrons.

19. Show that when $g_1 >> n_1$ the B.E. distribution formula reduces to M.B. distribution.

20. Prove that the phase space area equivalent to one Eigen state of a linear harmonic oscillator is h.

21. Find the Fluctuation in the number of particles in a perfect gas obeying F.D. statistics.

22. A particle of unit mass is executing S.H.M. Find its trajectory in the phase space.

(4 × 3 = 12 weightage)