M 20966

Reg. No. : .....

Name : .....

IV Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.) Examination, March 2012
(2009 Admn. Onwards)
PHYSICS
PH 401 : Statistical Mechanics

Time : 3 Hours Max. Marks : 50

Instructions : *Each question has **three** Parts.*
*Section **A** – contains **four** Essays of which the candidate has to answer **any two** questions and **each** question carries **10** marks.*

*Section **B** – Contains **eight** questions of which the candidate has to answer **five** questions and **each** question carries **3** marks.*

*Section **C** – Contains **five** problems of which the candidate has to answer **any three** and **each** question carries **5** marks.*

SECTION – A

(Answer **any two** questions, **each** question carries **10** marks)

1. What is canonical ensemble ? Discuss energy fluctuations in canonical ensemble.
2. State and prove equipartition theorem.
3. Discuss Bose-Einstein condensation with the necessary theory.
4. Discuss the Landau theory of diamagnetism. **(2×10=20)**

P.T.O.

SECTION – B

(Answer **any five** questions, **Each** question carries **3** marks).

5. Explain why no temperature change occurs during the expansion and mixing of gases described in connection with Gibb's paradox.
6. Describe the concept of phase space.
7. State and explain Liouville's theorem.
8. Define density operator.
9. Describe the behaviour of an ideal gas in a quantum mechanical micro canonical ensemble.
10. Explain the Plank's theory of black body radiation.
11. Briefly explain the statistical equilibrium of white dwarfs.
12. Explain ising model. **(5×3=15)**

SECTION – C

(Answer **any three** questions, **Each** question carries **5** marks)

13. Prove that the entropy as defined in the canonical and micro canonical ensemble differs only by terms of the order of logN.
14. Derive the expression for the internal energy of classical ideal gas.
15. Prove that the density fluctuations in grand canonical ensemble are vanishingly small in the thermodynamic limit provided the isothermal compressibility is finite.
16. Obtain the equation of motion for density matrix.
17. Obtain the equation of state of a spinless ideal Fermi gas. **(3×5=15)**