

M.Sc. F.Y. (Physics) (CBCS Pattern) Semester-II
PSCPHYT06 - Core Paper-VI - Statistical Physics

P. Pages : 2

Time : Three Hours



GUG/W/24/11221

Max. Marks : 80

Either:

1. a) State and prove Liouville's theorem. 8
- b) What is Gibb's paradox? How it is resolved? 8

OR

- e) What is fluctuation? Obtain an expression for mean square fluctuation of energy in Grand canonical ensemble. 8
- f) Explain the term 'Ensembles'. Discuss micro-canonical, canonical and grand-canonical ensembles. 8

Either:

2. a) Discuss the behaviour of ideal Bose gas below and above Bose temperature. 8
- b) Explain Bose-Einstein condensation phenomenon. 8

OR

- e) Explain symmetry of wave function for quantum particles. 8
- f) Show that for photon the mean pressure $\langle P \rangle$ is related to total energy E by relation: 8
- $$\langle P \rangle = \frac{1}{3} \frac{\langle E \rangle}{V}$$

Either:

3. a) What are cluster integrals? Discuss cluster expansion for classical gas system. 8
- b) Obtain virial equation of state. 8

OR

- e) Define Fermi function and Fermi energy obtain an expression for Fermi energy of ideal gas at $T = 0^\circ \text{K}$. 8
- f) Discuss the concept of an electronic specific heat in detail. 8

Either:

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| 4. | a) | Derive Fokker-Planck equation and apply it for Brownian particles. | 8 |
| | b) | Explain Landau theory of phase transition. | 8 |

OR

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|-----------|----|-------------------------------------------------------------------------------------|----------|
| | e) | What is Ising model and Discuss Ising model for phase transition of second order. | 8 |
| | f) | What is Brownian motion? Discuss Langevin's theory of Brownian motion of particles. | 8 |
| 5. | | Attempt all the followings. | |
| | a) | Discuss the term macrostate and microstate with the help of examples. | 4 |
| | b) | Explain Boltzmann limit of Bosons and Fermions. | 4 |
| | c) | Explain fermionic condensation. | 4 |
| | d) | Explain Weiss theory of ferromagnetism. | 4 |
