M.Sc. F.Y. (Physics) Sem-II

0142 - Statistical Physics Paper-III

P. Pages : 2 **GUG/S/19/2240**

Time : Three Hours * 1 6 6 5 * Max. Marks : 80

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1. Either.

a) State and prove Liouville's theorem. **8**

b) Define phase space. Show that density of phase points remains constant over phase trajectory. **8**

OR

e) Explain the term ensembles. Discuss microcanonical, canonical and grand-canonical ensembles. **8**

f) Obtain an expression for mean square fluctuations of energy in grand canonical ensemble. **8**

2. Either.

a) Explain the symmetry of wave functions for the system of indistinguishable particles. **8**

b) Obtain an expression for the mean occupation number for the bosons in B-E statistics. **8**

OR

e) Determine whether a gas at room temperature is degenerate of non-degenerate if the concentration of particles is $8.5x10^{28}\ m^{-3}$. **8**

f) For Bosons system in grand canonical ensemble show that average number of particles in energy state E_s is given by $< n_s >= \frac{1}{\left[e^{\beta(E_s-\mu)}-1\right]}$. **8**

3. Either.

a) What is fermionic condensation? Apply ideal fermi system to free electron in metal for finding fermi temperature of electron. **8**

b) Define fermi function, fermi energy and fermi temperature. Obtain an expression for fermi energy and mean energy of ideal fermi gas at T = 0K. **8**

OR

e) Do electrons have zero energy at absolute Zero? If not why? Explain briefly. **8**

f) Derive virial equation of states. **8**

4. Either.

a) Find Fokker-Planck's equation. **8**

b) What is Brownian motion? Discuss Langevin's theory of Brownian motion of particles. **8**

OR

e) What is Ising model? Discuss Ising model for phase transition of second kind. **8**

f) Explain Landau's theory of phase transition. **8**

5. All questions are compulsory.

a) Explain fluctuation and Gibb's Paradox. **4**

b) Explain the difference between B-E and F-D statistics. **4**

c) What is weak and strong degeneracy? **4**

d) Write short note on scaling hypothesis. **4**

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