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

PSCPHYT06 - Core Paper-VI : Statistical Physics

P. Pages : 2 **GUG/W/22/11221**

Time : Three Hours * 0 4 8 4 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.

Either:

1. a) Show that the density distribution function is constant along the phase trajectories of phase point. **8**

b) Explain the terms : **8**
i) Phase space
ii) Microstate and Macrostate

OR

e) Explain microcanonical ensemble and obtain expression for entropy of perfect gas. **8**

f) For canonical partition function of perfect gas, prove that : **8**
i) PV = NKT
ii) $< E >= 3/2\,NKT$

Either:

2. a) What is B-E Statistics? Derive an expression $n_i = \frac{g_i}{e^{\alpha+\beta Ei} - 1}$ for the most probable distribution of the particle of a system obeying B-E statistics. **8**

b) Discuss the behaviour of ideal Bose gas above the critical temperature. **8**

OR

e) Obtain Stefan – Boltzmann law of radiation from Planck's law. **8**

f) What is Bose – Einstein condensation? How does it differ from vapour condensation? **8**

Either:

3. a) Show that the pressure exerted by ideal fermi system at T = OK is given by pressure $P = \frac{2}{5}\frac{NE_F}{V}$ (E_F is fermi energy) **8**

b) Describe an expression to determine Fermi temperature of free electron in metal. **8**

OR

e) What are Mayer f-functions? Obtain the grand partition functions for classical real gas in terms of cluster integrals. **8**

f) Obtain an expression for virial equation of state for classical real gas. **8**

Either:

4. a) Discuss first order phase transition and obtain Clausius – Clapeyron equation. **8**

b) What are scaling laws? Describe scaling hypothesis using dimensional analysis. **8**

OR

e) Discuss Ising model for phase transition of second order. **8**

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

5. Attempt all the followings.

a) Explain how Sackur – Tetrode equation is obtained. **4**

b) Explain the behaviour of liquid He^4 below critical temperature on the basis of ideal base theory. **4**

c) Explain Fermionic condensation. **4**

d) Explain time correlation function. **4**

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