2016-18

Full Marks : 70

Time : 3 hours

Answer any five questions in which **Q.No.1**
is compulsory.

The questions are of equal value.

*Candidates are required to give their answers in their
own words as far as practicable.*

1. Answer in short (about in *50* words each) :

   (*a*) Discuss quantization of lattice vibrations.

   (*b*) Give an account of classification of ferro-
   electric materials.

   (*c*) What is superconductivity ?

   (*d*) Define entropy and give its SI unit.

   (*e*) What do you mean by phase space ?

   (*f*) Differentiate between Fermi-Dirac statistics
   and Bose-Einstein statistics.

   (*g*) Explain why ^{3}He does not show Bose-Einstein
   condensation but ^{4}He shows it.

(**2**)

2. Obtain the vibrational spectrum of one dimensional
arrangement of identical atoms. Hence discuss
normal modes of vibration in case of finite length
of lattice.

3. Explain the origin of electric field at a point in-
side an isotropic dielectric subjected to an elec-
tric field $\bar{E}$ and obtain an expression for it.

4. Give a critical account of Landau theory of phase
transition. https://www.vbuonline.com

5. Establish London equation for a superconductor
and discuss its applications.

6. Explain the concept of an ensemble. Differentiate
clearly between canonical ensemble and grand
canonical ensemble. Write the expression of
partition function of a system in grand canonical
ensemble and use it to calculate the entropy of one
mole of monoatomic perfect gas.

7. Discuss critically the change in entropy and spe-
cific heat of a conductor when it undergoes a
change from normal conducting state to supercon-
ducting state.