(i) **Printed Pages: 2** **Roll No. .....**

(ii) **Questions : 7** **Sub. Code :** | 0 | 3 | 4 | 7 |

Exam. Code : | 0 | 0 | 0 | 4 |

B.A./B.Sc. (General) 4th Semester

1059

PHYSICS

Paper—A (Statistical Physics and Thermodynamic—II)

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :— Attempt ***five*** questions in all, selecting ***two*** each from of Unit-I and Unit-II. Unit-III is compulsory. In Q. 7, attempt any ***eight*** parts. Ask for logarithmic tables if required.

UNIT—I

1. (a) What is statistical definition of entropy and its physical significance ? Prove that the entropy of an adiabatic process remains constant. 3

   (b) Calculate the increase in entropy of one mole of hydrogen gas when its temperature is raised from 0°C to 50°C at constant volume. C_v for hydrogen = 4.879 cal mol^{-1} K^{-1}. 1.5

2. (a) Define and find expressions for thermo-emf, Peltier coefficient and Thomson coefficient. 1.5

   (b) The air at N.T.P. is expanded adiabatically to 4 times original volume. Calculate the final pressure and temperature. Given $\gamma = 1.4$. 3

3. (a) What is S-T diagram ? Using it, derive an expression for efficiency of Carnot's heat engine. 3

   (b) The coefficient of performance of a refrigerator becomes infinite when the temperature of two bodies become equal. Why ? 1.5

UNIT—II

4. (a) Deduce Clapeyron equation from Maxwell's relations and explain the change of ice to water on the basis of it. 3

   (b) Find the change in the freezing point of water at 0°C for an increase of pressure by 1.0 atmosphere. Given, specific volume of ice at 0°C = 1.091 c.c., Latent heat of water at 0°C = 79.6 cal g^{-1} and 1 atm = 1.013 $\times 10^6$ dyne/cm^2. 1.5

5. (a) Discuss the liquification of Helium making use of regenerative cooling effect. 3

   (b) Write a note on adiabatic demagnetisation. 1.5

6. (a) What is Joule Thomson effect ? Discuss the effect for the Vander-Waal's gas. 3

   (b) How can we produce cooling by adiabatic stretching and adiabatic compression ? 1.5

UNIT—III

7. (a) What do you mean by thermal energy ?

   (b) The efficiency of heat engine cannot be 100%. Explain why.

   (c) Define Zeroth law of thermodynamics.

   (d) What do you understand by additive nature of entropy ?

   (e) What is temperature of inversion ?

   (f) Define thermodynamic potential F and G.

   (g) Find the change in energy of the system if 400 J of work is done on it, while 75 calorie heat flows out of it.

   (h) What are imperfect differentials ? Give one example.

   (i) Explain the cyclic process. 8×0.5=4