(i) Printed Pages: 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0347

Exam. Code : 0004

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

(2042)

PHYSICS

(Statistical Physics and Thermodynamic–II)

Paper–A

Time Allowed : Three Hours] **[Maximum Marks : 44**

Note :— Attempt **five** questions in all, selecting **two** questions each from Unit I and Unit II. Unit III is compulsory. From Q. No. 7 attempt any **eight** parts. Ask for Logarithamic Tables if required.

UNIT–I

1. (a) What are reversible and irreversible processes ? Show that the process of expansion of a gas is irreversible in nature. 6

   (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 Cv = 4.879 Cal $mol^{-1} K^{-1}$. 3

2. (a) Define and find expression for thermo-emf, Peltier coefficient and Thomson coefficient. 5

   (b) Find the pressure required to compress adiabatically a gas at atmospheric pressure to one fifth of its volume (given, $\gamma = 1.4$). 2

   (c) A Carnot heat engine absorbs 4000 J of heat from a reservoir at 300°C and rejects 2000 J to heat during each cycle. Calculate efficiency of heat engine. 2

3. (a) What is S-T diagram ? Using its derive an expression for the efficiency of Carnot heat engine. 5

(b) Discuss the thermodynamics of a thermocouple. Derive an expression for the thermo-emf developed on it. 4

UNIT–II

4. Discuss Joule-Thomson experiment. Why does an ideal show neither a heating nor a cooling effect in Joule-Thomson experiment ? Also explain why H_2 and Helium show heating effect Joule-Thomson expansion at ordinary temperature. 9

5. (a) Heat is produced by adiabatic compression of a substance. Explain it by using Maxwell's relations. 6

(b) Write a note on Adiabatic demagnetization. 3

6. (a) What is thermodynamical potential and hence derive Maxwell's thermodynamical relations ? What is their significance ? 6

(b) 1 gm of water vapour at 100°C and 1 atmospheric pressure occupies a volume of 1.64 liters. Find the vapour pressure at 99°C. Latent heat of vapourization L = 536 Cal. 3

UNIT–III

7. (i) What is thermodynamic probability ? What is its minimum value ?

(ii) Why is cooling produced when a gas expands adiabatically ?

(iii) Why a reversible heat engine cannot have 100% efficiency ?

(iv) State second law of thermodynamics.

(v) Entropy is a measure of disorder of the system. Explain.

(vi) What is regenerative cooling effect ?

(vii) What is temperature of inversion ?

(viii) Write Clapeyron equation and its significance.

(ix) What are perfect and imperfect differentials ?

$8 \times 1 = 8$