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

(ii) Questions : 7 Sub. Code : 0347

Exam. Code : 0004

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

(2053)

PHYSICS

Paper : A Statistical Physics and Thermodynamics–II

Time Allowed : Three Hours] [Maximum Marks : 44

Note :—Attempt **FIVE** questions in all, selecting **TWO** questions each from Unit–I and Unit–II. Q. No. 7 of Unit–III is compulsory. Ask for Logarithmic table if required.

UNIT—I

1. (a) What is Entropy ? Starting from its statistical definition show that an infinitesimally small amount of heat is given to a gas produce a change in entropy $ds = \frac{dQ}{T}$.

   (b) Find the pressure required to compress adiabatically a gas at atmospheric pressure to one fifth of its volume. (given $\gamma = 1.4$) 6,3

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

(b) Calculate the work done to compress a gas isothermally at N.T.P. to half of its volume.

Given R = 8.3 J mol $^{1}K^{-1}$. 6,3

3. (a) What is Thomson effect ? How does a thermocouple act like a heat engine ? Derive expression for dE/dT and d^2E/dT^2 for a thermocouple, where E and T have their usual meaning.

(b) Find the change in energy of system if 400 J of work a done on it, while 75 calorie heat flows out of it. 7,2

UNIT—II

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

(b) How can we produce cooling by adiabatic stretching and adiabatic compression ? 6,3

5. (a) What is Joule Thomson effect ? Discuss the effect for the van der Waal's gas.

(b) Calculate the fall in temperature produced by adiabatic demagnetisation of a paramagnetic salt at an initial temperature of 3K when a magnetic field in reduced from 0.85T to zero. Given curie constant/m^3 = 6×10^3 units and $C_H = 0.2 \times 10^3$ Cal $Kg^{-1}K^{-1}$. 6,3

6. Discuss four thermodynamical potential V, F, H and G and hence derive Maxwell's thermodynamics relations. 9

UNIT—III

7. (a) What are extensive and intensive parameters ?

(b) Why $C_p > C_v$?

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

(d) How will the entropy change during free expansion of gas ?

(e) Why does not efficiency of Carnot's engine depend on the properties of working substance ?

(f) State Zeroth law of thermodynamics.

(g) Explain the cyclic process.

(h) What is temperature of inversion ? What is its value for Helium ?

8×1