

(i) Printed Pages: 3

Roll No. ....

(ii) Questions : 7 Sub. Code : 

1	7	3	4	7
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Exam. Code : 

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B.A./B.Sc. (General) 4<sup>th</sup> Semester  
(2055)

### PHYSICS

Paper—A : Statistical Physics & 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. Question No. 7 of Unit—III is compulsory. Ask for logarithmic table if required.

#### UNIT—I

1. (a) Starting from statistical definition of entropy, show that

$$dS = \frac{\delta Q}{T}. \quad 5$$

- (b) 100 g of water at 0°C is mixed with an equal amount of water at 80°C. Calculate the increase in entropy. Given, specific heat of water = 1 cal g<sup>-1</sup>. 4

2. (a) What is Carnot's cycle ? Derive an expression for the efficiency of the Carnot's heat engine using one mole of an ideal gas as a working substance. 7

- (b) A gas is suddenly compressed to half of its original volume. Calculate the rise in temperature. The original temperature is 373 K and  $\gamma = 1.5$ . 2

3. (a) Discuss the thermodynamics of thermocouple using Peltier effect. Derive an expression for Peltier Coefficient. 7  
(b) Discuss the meaning and significance of "Heat Death" of Universe. 2

### UNIT—II

4. (a) What are four thermodynamic potentials ? Derive Maxwell's thermodynamic relations. 6  
(b) Find an expression for change in temperature of wire when stretched adiabatically. 3
5. (a) Give an account of the Joule-Thomson experiment. 5  
(b) Discuss the liquefaction of Helium using the principle of regenerative J-T cooling. 4
6. (a) Derive Clapeyron's latent heat equation on the basis of Maxwell's relations. Discuss its significances. 6  
(b) Write a short note on adiabatic demagnetization. 3

### UNIT—III

7. Attempt any **EIGHT** parts :
- (a) What is temperature of inversion ?  
(b) What is the nature of S-T diagram for a cyclic process ?  
(c) Why can't a reversible heat engine have 100% efficiency ?  
(d) What is third law of thermodynamics ?  
(e) How does entropy vary during isothermal process ?

- (f) What will be the entropy of combination of two systems having entropies  $S_1$  and  $S_2$  ?
- (g) What thermodynamic function is also called total heat function ?
- (h) What is the significance of P-V diagram ?
- (i) Express 1 cal in terms of Joule.
- (j) Define latent heat.  $8 \times 1 = 8$