

(i) Printed Pages: 3

Roll No. ....

(ii) Questions : 7

Sub. Code :

0	3	4	7
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Exam. Code :

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B.A./B.Sc. (General) 4<sup>th</sup> Semester  
(2054)

## PHYSICS

Paper-A : Statistical Physics and Thermodynamics-II

Time Allowed : Three Hours]

[Maximum Marks : 44

**Note** :—Attempt **FIVE** questions in all, selecting two each from Unit-I and Unit-II. Q. No. 7 of Unit-III is compulsory. From Q. No. 7 attempt any **EIGHT** parts.

### UNIT—I

1. (a) Prove that entropy of a system remains constant during adiabatic reversible process. 5
- (b) Show that the process of diffusion of one gas into another is always accompanied by an increase in entropy. 4
2. (a) What is heat engine ? Explain its principle, working and define efficiency. Why the efficiency of a heat engine cannot be 100% ? 6
- (b) Write a note on heat death of the universe. 3

3. (a) What is S-T diagram ? Using it, derive an expression for efficiency of Carnot's heat engine. 5
- (b) What is Thomson effect ? How does a thermo couple act like a heat engine ? 4

## UNIT—II

4. Discuss the Joule-Thomson Experiment. Why does an ideal gas show neither a heating nor a cooling effect in Joule-Thomson experiment ? Also explain why  $H_2$  and Helium show heating effect in 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) The melting point of ice decreases and melting point of wax increases with increase in pressure. Explain. 3
6. (a) Discuss the liquefaction of Helium making use of regenerative cooling effect. Prove that the change in temperature due to adiabatic expansion of any substance is given by  $dT = -\frac{T\beta P}{C_v}dV$ . 6
- (b) Write a note on Adiabatic demagnetization. 3

## UNIT—III

7. (a) What do you understand by additive nature of entropy ?
- (b) What is thermal energy ?

- (c) Explain the cyclic process.
- (d) What is thermodynamic probability ? What is its minimum value ?
- (e) Write Maxwell thermodynamic relations.
- (f) 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.
- (g) A Carnot heat engine absorbs 5000 J of heat from a reservoir at 327°C and rejects 2000 J heat during each cycle. Calculate efficiency of heat engine.
- (h) Explain intensive and extensive parameter with examples.
- (i) What is significance of  $\Delta S \geq 0$  relation to entropy ?
- (j) Why  $C_p > C_v$  ?

$$8 \times 1 = 8$$