STATISTICAL PHYSICS AND THERMODYNAMICS–II

Paper - I Semester - IV

Time Allowed : Three Hours] [Maximum Marks : 35

Note : The candidates are required to attempt *two* questions each from Section A and B carrying 8 marks each and the entire Section C consisting of 8 short answer type questions carrying 1 marks each.

Section : A

1. Give two examples that justify the law of increase of entropy. 8
2. (a) Obtain the relationship between entropy and thermodynamic probability. Explain that entropy is a measure of disorder.
   (b) Prove that entropy is an extensive parameter. 5,3
3. (a) State and explain second law of thermodynamics in different statement forms.
   (b) Calculate the difference in two specific heats of 1 gm of oxygen. Molecular weight of oxygen is 32 and $J = 4.2 \times 10^7$ erg/cal. 4,4
4. How can thermocouple act like a reversible heat engine ? Derive expression for $\frac{dE}{dT}$ and $\frac{d^2E}{dT^2}$ where E and T have their usual meaning. 8

Section : B

5. Derive Maxwell's thermodynamic relations using thermodynamic potential. 8

6. Discuss the variation of C_v with volume for
   (i) perfect gas 8
   (ii) Real gas using Maxwell thermodynamics relations.

7. (a) Discuss the cooling produced by adiabatic stretching using Maxwell's thermodynamical relation. 5,3
   (b) Discuss the results of Joule Thomson experiment. 8

8. Describe the use of thermo-magnetic effect to produce low temperature.

Section : C

9. Answer briefly :
   (a) What are intensive and extensive parameters ?
   (b) How do you conclude that entropy is a state variable ?
   (c) On what factors does the efficiency of a Carnot's cycle depend?
   (d) What is a refrigerator ?
   (e) What is thermodynamic scale of temperature ?
   (f) What is internal energy ?
   (g) Outline the importance of TS diagram.
   (h) Calculate the change in tentropy when 5g of water at 100°C changes in to steam at 100°C. 1×8=8
   Latent heat of steam = 540 cal/g.