This question paper contains 2 printed pages.]

Your Roll No. .....

1394 **A**

B.Sc. (Hons.)/I

ELECTRONIC SCIENCE—Paper 1.3 (III)

(Thermal Physcis)

Time : 3 *Hours* *Maximum Marks* : 38

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt ***five*** *questions in all, including* Q. No. **1** *which is compulsory.*

1. (a) Show that change in entropy in reversible adiabatic process is zero. 2×5

   (b) Obtain an expression for Adiabatic Lapse Rate.

   (c) Find the efficiency of a Carnot's engine working between steam point and ice point.

   (d) Using first law of Thermodynamics prove that :

$$C_P - C_V = R$$

   (e) Using law of equipartition of energy calculate $r\left(C_P/C_V\right)$ for mono-atomic and diatomic gases.

2. (a) Distinguish between first order and second order phase transition with examples. 3

   (b) Obtain the Ehrenfert's equation : 4

$$\frac{dP}{dT} = \left(\frac{\alpha_2 - \alpha_1}{K_2 - K_1}\right)$$

Where symbols have their usual meanings.

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3 (a) Deduce Maxwell's distribution law of molecular speeds in a gas. 5

(b) Show that the average speed of molecules in a gas is given by : 2

$$\bar{v} = \sqrt{\frac{8\,KT}{m\pi}}$$

4. (a) Using Maxwell's thermodynamical relations prove that :

$$C_p - C_v = TE\alpha^2V \qquad 3\frac{1}{2}$$

(b) Show that 3½

$$\frac{\beta_S}{\beta_V} = \frac{r}{r-1}$$

Where symbols have their usual meanings.

5. (a) State the assumptions made by Planck and hence derive the radiation formula. 4

(b) Obtain the limiting cases for short and long wave lengths in Planck's radiation law. 3

6. (a) Distinguish between Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. 3

(b) Dedice the expression for distribution function in case of a system of particles obeying Bose-Einstein statistics. 4

7. Write short notes on any *two* of the following : 7

(a) Mean free path

(b) Fermi energy at absolute zero

(c) Transport phenomena