

Roll No.

41272

**B. Sc. (Hons.) Physics 4th Semester
Examination – May, 2019**

THERMAL PHYSICS - II

Paper : Phy-402

Time : Three hours] [Maximum Marks : 40

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting at least *two* question from each Unit. Use of Scientific (non programmable) calculator is allowed

UNIT – I

- 1. (a) Describe Carnot's cycle and deduce the efficiency of ideal heat engine. 4
- (b) Enunciate the second law of thermodynamics. Deduce from this the thermodynamically scale of temperature. Discuss how this scale is related to the perfect gas scale. 4

P. T. O.

41272

- 2. (a) Derive Clapeyron's Latent heat equation

$$\frac{dP}{dt} = \frac{L}{T(v_1 - v_2)}$$

. Also Discuss how the boiling point of a liquid and melting point of a solid are affected by change of pressure. 5

- (b) A Carnot's ref takes heat from water at 0°C and discards it to a room at 27°C . 1 kg of water at 0°C is to be changed into ice at 0°C. How many calories of heat are discarded to the room ? What is the coefficient of performance of Machine. 2

- (c) What are limitations of first Law of Thermodynamics. 1

- 3. (a) What is Joule-Thomson effect ? Obtain an expression for the cooling produced in a Vander weal gas. Explain why hydrogen show heating effect at ordinary temperature. 4

- (b) Calculate the change in entropy, when 10 gm of water at 100°C is converted into steam at the same temperature. 2

- (c) "Entropy is measure of disorder." Justify the statement. 2

- 4. (a) Define entropy. What is its physical significance ? Derive an expression for change in entropy of a perfect gas in terms of pressure and temperature. 5

(2)

- (b) One mole of a gas expands isothermally to 4 times in volume, calculate the change in entropy in terms of gas constant.
- (c) If the door of a working refrigerator is kept open for a long time, will it make the room cool or warm?

UNIT - II

- 5. (a) Show that $C_p - C_v = TE\alpha^2 V$ where C_p & C_v are the specific heats at constant pressure and volume respectively; E is bulk modulus of elasticity, α is coefficient of volume expansion and V is specific volume.
- (b) Discuss about the first order phase transition and hence Clausius-Clapeyron's latent heat equation. Can latent heat become zero? If yes, under what condition?
- 6. (a) Discuss about second order phase transition and hence derive Ehrenfest's equations.
- (b) Using Maxwell's thermodynamical relation prove that for any substance, the ratio of the adiabatic and isothermal elasticities is equal to ratio of two specific heats.

- (a) Derive Maxwell's four thermodynamically relations. 4
- (b) Explain cooling due to adiabatic demagnetisation. 4
- (a) Explain the phenomena of Conversion of magnetic temperature to kelvin temperature (near absolute zero). How are such temperature measured. 4
- (b) Using Maxwell's thermodynamically relation, Discuss the variation of intrinsic energy with volume for a perfect gas and a gas obeying vander Waal's equation. 4

