

7. (a) From Maxwell's relation show that $C_p - C_v = TE \alpha^2 V$, where 'T' is the absolute temperature, 'E' the modulus of isothermal elasticity, ' α ' the coefficient of volume expansion and 'V' the specific volume. **10**

- (b) Prove the thermodynamic relation : **6**

$$TdS = C_v dT + T \left(\frac{\partial P}{\partial T} \right)_V dV$$

Unit IV

8. (a) Derive an expression for Joule's coefficient of real gas. **8**
- (b) What do you understand by virial coefficient ? What is the value of first virial coefficient ? How does the second virial co-efficient vary with temperature ? **8**

Subject Code—52552

B.Sc. EXAMINATION

(Main/Reappear) (Batch 2018 Onwards)

(Third Semester)

PHYSICS

CPL-302, Course V

(Heat and Thermodynamics)

Time : 3 Hours

Maximum Marks : 80

Note : Attempt any *Five* questions. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) Can a kitchen be cooled by leaving the door of a refrigerator open ? **2**
- (b) Explain reversible and irreversible process with example. **2**
- (c) State second law of thermodynamics in terms of entropy. **2**

- (d) What are thermodynamic variables ? 2
- (e) Write first Maxwell thermodynamic equation. 2
- (f) What is the second order phase transformation ? 2
- (g) Define critical temperature T_C . 2
- (e) What do you mean by coefficient of performance ? 2

Unit I

- 2. (a) State first law of thermodynamics. Give its physical significance. What are the limitations of first law ? 12
- (b) Find the efficiency of the Carnot's engine working between the steam point and the ice point. 4
- 3. (a) Explain, why the gases have two specific heats ? Explain, why the specific heat at constant pressure C_p is greater than that C_v the specific heat at constant volume. Prove $C_p - C_v = R$. 10
- (b) State and prove Carnot's theorem. 6

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Unit II

- 4. (a) What is T-S diagram ? What is the importance of T-S diagram ? Find the expression for efficiency of a reversible Carnot's engine with the help of T-S diagram. 12
- (b) When 50 g of water is heated from 0°C to 90°C , by how much does its entropy change ? 4
- 5. (a) Derive an expression for the entropy of a perfect gas in terms of pressure and temperature. 10
- (b) State and explain with example the third law of thermodynamics. Prove that it is impossible to obtain absolute zero temperature. 6

Unit III

- 6. What do you understand by the thermodynamic potential ? Explain *four* thermodynamical potential. Deduce from thermodynamic potential the corresponding Maxwell's thermodynamic relations. 16

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P.T.O.

9. (a) What is temperature of inversion ? Derive the expression for inversion temperature for van der Waal's gas $T_i = \frac{2a}{Rb}$. **10**
- (b) Describe the Porous plug experiment. What conclusion have been drawn ? **6**

9. (a) What is temperature of inversion ? Derive the expression for inversion temperature for van der Waal's gas $T_i = \frac{2a}{Rb}$. **10**
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