

22406

23124

3 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

-
- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
 - (8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

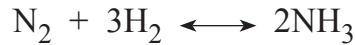
1. **Attempt any FIVE of the following :** **10**
 - a) Define 'Thermodynamics'.
 - b) List any two examples of 'Open System'.
 - c) State Zeroth law of Thermodynamics.
 - d) Define 'Specific heat'
 - e) State the relation between ' C_p ' and ' C_v '
 - f) State 'Gibb's Phase Rule'.
 - g) Explain the term 'Entropy'.

P.T.O.

2. Attempt any THREE of the following : 12
- Represent 'Adiabatic Process' on P–V and T–S diagram.
 - Differentiate between 'Work' and 'Heat'.
 - 0.1 m³ of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m³. Calculate final pressure of gas and heat supplied during the process.
 - State, explain second, third law of thermodynamics along with their mathematical statements.
3. Attempt any THREE of the following : 12
- List different types of equilibrium for thermodynamic system ? Give example of each .
 - A certain gas occupies space of 0.3 m³ at pressure 2 bar and temperature 77°C. It is heated at constant volume until pressure is 7 bar.
Calculate -
 - Change in Internal Energy
 - Change in enthalpy
 - Explain in detail 'Clausius Inequality'.
 - Explain P-H Thermodynamic diagram.
4. Attempt any THREE of the following : 12
- Write 'Van der Wall's equation for real gas ? State the meaning of each term.
 - Assuming that air is a mixture of 21% Oxygen and 79% Nitrogen by volume. Calculate entropy of 1 Kilo mole of air relative to pure Oxygen and Nitrogen at same temperature and pressure.
 - Prove that Adiabatic mixing of two fluid is irreversible.
 - Write 'Van't Hoff' equation. State the effect of rise in temperature for exothermic reaction.
 - Derive relation between 'K_p' and 'K_c'

5. Attempt any TWO of the following :**12**

- a) Explain 'Joule - Thomson porous plug experiment.
- b) Explain T-V diagram for pure substance.
- c) Calculate K_p for Ammonia synthesis at total pressure of 26 atm at 380°C, Reaction is



Assume percentage of Ammonia is 20%.

6. Attempt any TWO of the following :**12**

- a) Draw phase diagram for Carbon-di-Oxide system.
- b) Explain the term
 - i) Degree of freedom
 - ii) Vander Waals constant
- c) Derive the relation between thermodynamic equilibrium constant and conversion for second order reversible reaction

