

23/05/2025 SE CHEMICAL SEM-IV C-SCHEME CET-II QP CODE: 10081010

Time: 3hour

Marks: 80

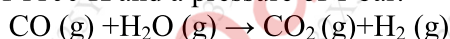
N.B. (1) Question No 1 is compulsory**(2) Attempt any three questions out of remaining five questions****(3) Assumption made, if any should be clearly stated****Q.1 Solve any Four 20**

- Give the difference between Ideal and Non Ideal solution
- State Raoult's law. Show that it is simplified form of Lewis Randall Rule
- Explain Effect of Temperature on Chemical Potential
- Explain Refrigerator capacity
- A refrigeration machine operating at a condenser temperature of 290 K needs 1 kW of power per ton of refrigeration. Determine the following:
 - The coefficient of performance
 - The heat rejected to the condenser
 - The lowest temperature that can be maintained

Q.2a) Define 10

- Equilibrium constant
- Extent of reaction or reaction coordinate.

- A mixture of 1 mole of CO and 1 mole of water vapour is undergoing the water- gas shift reaction at a temperature of 1100 K and a pressure of 1 bar. **10**



The equilibrium constant for the reaction is $K=1$. Assume that the gas mixture behaves as ideal gas. Calculate

- The fractional dissociation of steam
- The fractional dissociation of steam if the reactant stream is diluted with 2 mol nitrogen.

Q.3a) Explain VLE in ideal and non-ideal solutions. 10

- Define Refrigeration. Discuss Vapour compression refrigeration cycle **10**

Q.4a) Define excess property and Property change of Mixing and show that the property change of mixing and excess properties are identical. 10

- Derive various forms of Gibbs-Duhem equation **10**

Q.5a) Explain different methods of determination of partial molar properties 10

- Derive Van't Hoff Equation **10**

Q.6a) The vapour pressures of acetone(1) and acetonitrile(2) can be evaluated by the Antoine equations. 10

$$\ln p_1^s = 14.5463 - \frac{2940.46}{T - 35.93}$$

$$\ln p_2^s = 14.2724 - \frac{2945.47}{T - 49.15}$$

where T is in K and P is in kPa. Assuming that the solution formed by these are ideal, calculate

- x_1 and y_1 at 327 K and 65 kPa
 - T and y_1 at 65 kPa and $x_1 = 0.4$
 - P and y_1 at 327 K and $x_1 = 0.4$
- Explain Boiling point diagram (T-x-y plot) and equilibrium diagram (x-y plot) for binary solution **10**

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