

Total No. of Question : [4]

Registration No. :

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Programme Name : Bachelor of Chemical Engineering

Regular T.Y.B.Tech. ESE (A.Y. 2023-24) Sem.V Nov.2023

V SEMESTER (2021 BATCH)

201CHL302-Chemical Engineering Thermodynamics-II(TH)

Duration : [11:00 AM - 01:00 PM]

Date : 22 Nov, 2023

Day : Wednesday

Marks : 50

Instructions :

1.Read questions carefully.

(Q1) All Questions are compulsory

[20.0]

CO :- 1, 2, 3

Blooms Taxonomy :- Remember, Understand, Apply

(1.1) For the system ethyl ethanoate (1) / n-heptane (2) at 343.15K (70°C) $\ln \gamma_1 = 0.95x_2^2$ [6.0]

$$\ln \gamma_2 = 0.95x_1^2$$

$$P_1^{\text{sat}} = 79.80\text{KPa} \quad P_2^{\text{sat}} = 40.50\text{KPa}$$

Assuming validity of equation for modified Raoult's law ?

Make a BUBL P calculations for $T = 343.15\text{K} (70^\circ\text{C})$, $x_1 = 0.05$

(1.2) Derive the expressions for partial molar properties in binary mixture [7.0]

(1.3) Derive an expression for Fugacity and fugacity coefficient for pure species. [7.0]

(Q2) All Questions are compulsory

[10.0]

CO :- 4

Blooms Taxonomy :- Remember, Understand, Apply

(2.1) Write down different equations for activity coefficient models. [4.0]

(2.2) The van Laar constants A & B for the system nitromethane (1) / carbon tetra chloride [6.0]

(2) at 45°C are 2.230 & 1.959 resp. Calculate the activity coefficients of the components in a solution containing 30 mol% nitromethane.

OR [2.2 / 2.3]

(2.3) Explain in brief Property change of mixing [6.0]

(Q3) All Questions are compulsory

[10.0]

CO :- 5

Blooms Taxonomy :- Remember, Understand, Apply

(3.1) Define reaction coordinate and write phase rule for reacting system [3.0]

(3.2) A system formed initially of 2 mol CO₂, 5 mol H₂ and 1 mol CO undergoes [7.0]

the reactions: $\text{CO}_2(\text{g}) + 3\text{H}_2(\text{g}) = \text{CH}_3\text{OH}(\text{g}) + \text{H}_2\text{O}(\text{g})$

$\text{CO}_2(\text{g}) + \text{H}_2(\text{g}) = \text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g})$

Develop expressions for the mole fractions of the reacting species as functions of the reaction coordinate for the two reactions.

OR [3.2 / 3.3]

(3.3) Explain in brief Evaluation of Equilibrium constant

[7.0]

(Q4) **Attempt any two out of three questions**

[10.0]

CO :- 6

Blooms Taxonomy :- Remember, Understand, Apply

(4.1) What are the different criteria for the phase equilibrium

[5.0]

(4.2) Distinguish between Ideal and Non Ideal solutions

[5.0]

(4.3) Write a short Note on Liquid Liquid Equilibrium

[5.0]
