Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2163508 **Date:16/05/2019**

Subject Name:Basics of Thermodynamics & Kinetics

Time:10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

MARKS

Q.1 **(a)** Define: Extensive property, intensive property and reversible process **03**

(b) Explain phase rule with equation. **04**

(c) Derive fundamental property relation equation for U, H, A and G. **07**

Q.2 **(a)** Define modified Raoult's law with equation. **03**

(b) List out different methods for thermodynamic consistency test and explain any two in detail. **04**

(c) Mixtures of n-Pentane (1) and n-Heptane (2) conform to ideal solution behaviour. The vapour pressures of pure components are adequately described by Antoine's equation. Prepare P-x-y diagram at 70°C. **07**

	A	B	C
n-Pentane	6.87632	1075.780	233.205
n-Heptane	6.89386	1264.370	216.640

Use Antoine's equation: $\log_{10}P = A - (B / (T + C))$ where pressure P is in Torr and temperature T is in °C.

OR

(c) Prepare P-X-Y diagram at temperature of 100 °C for a binary system Benzene(1) and Ethyl benzene(2).Assume that Raoult's low is valid and use the following Antonie equation. **07**

$\ln P_1^{sat} = A - B/(T + C)$

Where P_1^{sat} in KPa and T is in °C

Component	A	B	C
Benzene	13.8594	2773.78	220.07
Ethyl benzene	14.0045	3279.47	213.20

Q.3 **(a)** Explain Henry's law. **03**

(b) Explain limitations of chemical potential. **04**

(c) Write different methods for determination of partial molar properties and explain any one in detail. **07**

OR

Q.3 **(a)** Explain Lewis Randall rule. **03**

(b) Explain maximum boiling azeotrope with example. **04**

(c) Derive Gibbs Duhum equation. **07**

Q.4 **(a)** Write a short note of equilibrium constant with equation. **03**

(b) Derive $\Delta G^0 = -RT \ln K$ **04**

(c) Explain criteria of chemical reaction equilibrium. **07**

OR

Q.4 **(a)** Define: Excess properties and Residual properties **03**

(b) Explain effect of temperature on Equilibrium constant. **04**

(c) Write the steps for calculating DEW P and DEW T using modified Raoult's law. **07**

Q.5	**(a)**	The activation energy of a bimolecular reaction is about 9150 Cal/mol. How much faster is this reaction takes place at 500 K than at 400 K?	**03**
	(b)	Write difference between order of reaction and molecularity of reaction.	**04**
	(c)	Derive the rate equation for constant volume batch reactor for second order reaction in terms of conversion.	**07**

OR

Q.5	**(a)**	Define: Catalyst deactivation and different types of catalyst deactivation.	**03**
	(b)	Write difference between integral and differential method of rate analysis.	**04**
	(c)	Write a short note on Transition state theory.	**07**

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