Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:2160501 Date:13-12-2022

Subject Name:Mass Transfer Operation - II

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Write a short note on types of reflux ratio.	**03**
	(b)	Relative Volatility (α) is the ratio of vapor pressure of the components- Prove this.	**04**
	(c)	Write short note on adsorbents with their characteristics. Also state few	**07**
Q.2	**(a)**	Explain Differential Distillation. Derive Rayleigh's Equation.	**03**
	(b)	Write in brief about Azeotropic distillation.	**04**
	(c)	Derive operating line equation for Flash Distillation. Draw operating line for (a) Feed is totally vaporized (b) No feed is vaporized.	**07**
		OR	
	(c)	A mixture of 45 mol% Benzene and remaining Toluene is continuously fractioned in a tower. Feed is liquid at its boiling point and is introduced at 5 kmol/s rate. This gives 98 % benzene in distillate and 98 % toluene in bottoms. Find amount of Distillate and Bottoms. Find minimum reflux ratio and number of plates when total reflux is used. Equilibrium data in mole fraction is given as	**07**

x	1	0.78	0.58	0.41	0.26	0.13	0.017
y	1	0.9	0.78	0.63	0.49	0.26	0.039

Q.3	**(a)**	Write down the assumptions of McCabe-Thiele method.	**03**
	(b)	Derive equation for Adiabatic Saturation Curve.	**04**
	(c)	What is the selection criteria employed on the various types of cooling towers? Explain any one type of cooling tower in detail.	**07**
		OR	
Q.3	**(a)**	Discuss about various types of adsorption.	**03**
	(b)	Explain Adsorption hysteresis.	**04**
	(c)	Write Freundlich equation and explain. Write material balance for a single stage adsorption and apply Freundlich equation in it.	**07**
Q.4	**(a)**	Differentiate between Bound, Unbound and Free moisture in context with the drying operations.	**03**
	(b)	Discuss about ion exchange process used in softening of water.	**04**

	(c)	Derive the equation for the rate of adsorption in a fixed bed and explain the concept of degree of saturation.	**07**

OR

Q.4	**(a)**	Compare forced draft and induced draft cooling tower.	**03**
	(b)	Define and explain followings: a) Equilibrium moisture b) Bound moisture c) Unbound moisture d) Critical moisture content	**04**
	(c)	Explain Extractive distillation by citing proper example. Also write requirements of solvent to be used in distillation.	**07**
Q.5	**(a)**	Briefly explain freeze drying.	**03**
	(b)	Classify dryers and discuss selection criteria for dryers.	**04**
	(c)	Explain construction, working, advantages & disadvantages of tray dryer.	**07**

OR

Q.5	**(a)**	Explain with the sketch, the principle and working of rotary dryer.	**03**
	(b)	Explain with the sketch, the principle and working of fluidized bed drier?	**04**
	(c)	Derive the relation to determine the time needed for constant and falling rate period of the batch drying operations.	**07**

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