GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2160501   **Date:28/04/2018**
Subject Name:Mass Transfer Operation - II
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.**

Q.1	**(a)**	Explain characteristics of ideal solutions with Raoults's law.	**03**
	(b)	Discuss positive deviations from ideality with neat sketch.	**04**
	(c)	With neat diagram explain the theory of wet-bulb temperature and derive the equation for wet-bulb temperature determination.	**07**
Q.2	**(a)**	Write short note on flash distillation.	**03**
	(b)	Write in brief on Azeotropic distillation.	**04**
	(c)	A liquid mixture of 50 mole% n-heptane (i) and 50 mole% n-octane (ii) were subjected to differential distillation at atmospheric pressure with 55 mole% of the liquid distilled. Compute the composition of the composite distillate and the residue.	**07**

"x"	1.00	0.50	0.46	0.42	0.38	0.34	0.32	0.00
"y"	1.00	0.689	0.648	0.608	0.567	0.523	0.497	0.00

OR

	(c)	A continuous distillation column is to separate 50 Kmol/hr of feed mixture having 65% Benzene (A) and 35% Toluene (B). Top product contains 95% Benzene and Bottom product contains 95% Toluene (by mole).Feed is saturated liquid at its bubble point. Average relative volatility is 2.44. If reflux ratio R= 2.25 R_{min}, determine feed tray location and number of theoretical stages by Mccabe-Thiele method.	**07**
Q.3	**(a)**	Discuss applications of steam distillation.	**03**
	(b)	Write short note on types of reflux ratio and its significance.	**04**
	(c)	Derive Fenske's equation for the minimum number of theoretical stages.	**07**

OR

Q.3	**(a)**	Discuss importance of vacuum distillation.	**03**
	(b)	Explain the following terms: i) Bound moisture ii) Free moisture iii) Equilibrium moisture iv) Critical moisture	**04**
	(c)	Write Freundlich equation? How is it applied to two-stage cross current adsorption?	**07**
Q.4	**(a)**	Write short note on adsorbents with their characteristics.	**03**
	(b)	Derive the relation to determine the time needed for constant & falling rate period of the batch drying operations.	**04**
	(c)	Explain construction, working, advantages & disadvantages of rotary dryer.	**07**

OR

Q.4	**(a)**	For adsorption operation, explain following: i) Adsorption hysteresis ii) Nature of adsorbents	**03**
	(b)	Explain rate of drying curve.	**04**

	(c)	Define: (1) Absolute humidity (2) Relative humidity (3) Dry-bulb temperature (4) Wet-bulb temperature (5) Humid volume (6) Humid Heat (7) Lewis relation	**07**
Q.5	**(a)**	Explain relative volatility and derive its relationship equation with equilibrium compositions in vapor and liquid phases.	**03**
	(b)	Compare and contrast physical adsorption and chemisorptions.	**04**
	(c)	What do you mean by Ion Exchange? Describe techniques and application of ion exchange and list out the factors on which rate of ion exchange is dependent.	**07**

OR

Q.5	**(a)**	Explain adsorption isotherm with figure.	**03**
	(b)	Qualitatively, explain the apparent adsorption of solute from solution.	**04**
	(c)	Explain the various types of cooling towers and discuss their selection criteria.	**07**

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