Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER • 2015

Subject code: 160501 **Date: 01/05/2015**

Subject Name: Mass Transfer Operation II

Time: 10.30AM-01.00PM **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 fractionating column operating at 1atm pressure is fed with saturated liquid fees containing 40 mole % ethanol and 60 mole % water. The column produces saturated liquid overhead product containing 80 mole % ethanol and saturated bottom product containing 20 mole % ethanol. The reflux ratio is 2. The relative volatility is 2.2. Determine the number of theoretical stages required for given separation and feed plate location.	**14**
Q.2	**(a)**	What is Azeotrope? Distinguish between minimum and maximum boiling azeotropes with examples of each.	**07**
	(b)	Define quantity 'q'. Derive equation for q-line and discuss location of 'q' line for typical feed condition in brief.	**07**
		OR	
	(b)	What is reflux ratio? Discuss the Minimum reflux ratio, total reflux ratio and Optimum reflux ratio.	**07**
Q.3	**(a)**	An air (B)-water vapor (A) sample has a dry bulb temperature 55 $^{\circ}$C and an absolute humidity 0.030 kg water/ kg dry air at 1 atm pressure. Determine the following (i) the absolute molal humidity (ii) the partial pressure of water vapor (iii) relative humidity (vapor pressure of water at 55 $^{\circ}$C = 118 mmHg (iv) Humid heat (v) Humid volume, where pressure in N/m^2	**10**
Q.3	**(b)**	Explain the following terms for air- water system (a) Dew point (b) Wet bulb temperature (c) dry bulb temperature.	**04**
		OR	
Q.3	**(a)**	Define: 1) Percentage Absolute humidity 2) Humid Volume 3) Dew Point.	**07**
	(b)	Define adiabatic saturation curve and derive equation for the same.	**07**
Q.4	**(a)**	Explain the various types of cooling towers and discuss their Selection criteria.	**07**
	(b)	What is Adsorption? Discuss the types of Adsorption in details?	**07**
		OR	
Q.4	**(a)**	Discuss about Principles, techniques and applications of ion exchange in detail.	**07**
Q.4	**(b)**	Explain Adsorption isotherm and hysteresis	**07**

Q.5	**(a)**	A 150 kg batch of granular solids containing 32% moisture is to be dried in a tray dryer to 17 % moisture by passing a current of air at 350 k across its surface at a velocity of 1.8 m/s. If the constant rate of drying under these conditions is 0.75 x 10^{-3} kg/m^2s and the critical moisture content is 15 %. The drying surface is 0.03 m^2/kg dry weight. Calculate the drying time.	**08**
	(b)	Differentiate between Bound, Unbound and Free moisture in context with the drying operations.	**06**

OR

Q.5	**(a)**	Describe rate of drying curve in detail	**07**
	(b)	Classify driers and discuss selection criteria for dryers.	**07**

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