Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER VI– • EXAMINATION – Summer-2015

Subject Code:160405 **Date:12/05/2015**

Subject Name: Principles of Process Engineering-III

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)** Define wet-bulb temperature. Derive the expression for wet-bulb depression using concepts of wet-bulb theory, simultaneous heat and mass transfer and Lewis relation. **07**

(b) An air-water vapour mixture has dew point of 35°C and wet bulb temperature of 39°C at 1 atmospheric pressure. Calculate humidity, % humidity, relative humidity, humid volume, saturation humidity and enthalpy using psychometric chart. **07**

Q.2 **(a)** For adsorption operation, explain following: **07**

i) Type of Adsorption

ii) Nature of adsorbents

(b) Write a short note on : **07**

i) Adsorption hysteresis

ii) Heat of adsorption

ii) Adsorption from concentrated liquid solutions

OR

(b) Explain equilibrium characteristics (Freundich adsorption isotherm) for adsorption from liquid solution on solids. **07**

Q.3 **(a)** Explain concepts of freeze drying and its applications in biotechnology. **07**

(b) Explain the following terms: **07**

i) Bound moisture ii) Free moisture

iii) Equilibrium moisture iv) Critical moisture

OR

Q.3 **(a)** Explain minimum boiling and maximum boiling azeotropes with examples **07**

(b) Write short note on mechanism, equilibria and rate of ion exchange **07**

Q.4 **(a)** Explain azeotropic distillation operation with neat figure. **07**

(b) A mixture of 50 % mole n-heptane and 50 % mole n-octane at 30°C is continuously flash distilled at 1 std atmosphere so that 60 mole % of the feed is vaporized. What will be the composition of the vapor and liquid products? **07**

Equilibrium data are as given below (mole fractions)

x_A	0.1	0.2	2.3	0.4	0.5	0.6	0.7	0.8	0.9
y_A	0.247	0.453	0.607	0.717	0.796	0.853	0.898	0.935	0.968

OR

Q.4 **(a)** Explain importance of reflux. Explain minimum, maximum and optimum reflux ratio. **07**

(b) Explain stepwise procedure to find number of trays required using McCabe Thiele method. **07**

Q.5	**(a)**	Explain construction, working, advantages & disadvantages of tray drier.	**14**
		OR	
Q.5	**(a)**	Mention and explain the factors affecting the rate of drying.	**07**
	(b)	Write short note on types of crystallizers.	**07**

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