Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIth SEMESTER–EXAMINATION – MAY- 2012

Subject code: 160405 **Date: 19/05/2012**

Subject Name: Principles of Process Engineering-III

Time: 10:30 am – 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)** With the help of psychrometric graphs and their terms, explain… **06**

(i) All the curves of constant percentage saturation reach infinity at the boiling point of the liquid at the prevailing pressure.

(ii) All mixtures of same absolute humidity Y' have the same dew point.

(b) For Adsorption operations, explain… **08**

(i) Types of Adsorption (ii) Nature of Adsorbents.

Q.2 **(a)** Explain adsorption equilibria for single gases and vapors on solids. Also, discuss effect of various parameters on its equilibrium characteristics in detail. **07**

(b) Define "adiabatic saturation temperature". Also, derive the equation for "adiabatic saturation curve" on the psychrometric chart. **07**

OR

(b) Air at 1 atm. is blown past the bulb of a mercury thermometer. The bulb is covered with a wick. The wick is immersed in an organic liquid (Mol. Wt. = 58). The reading of the thermometer is 8°C. At this temperature the vapor pressure of the liquid is 6 kPa. Find the air temperature, given that the ratio of the heat transfer coefficient to the mass transfer coefficient is 2 kJ/kg- K and the latent heat of vaporization of the liquid is 360 kJ/kg. Assume that the air which is blown is free from the organic vapor. **07**

Q.3 **(a)** Explain Flash distillation in detail with neat diagram. **07**

(b) Derive Rayleigh's equation for differential distillation. **07**

OR

Q.3 **(a)** Explain in brief McCabe Thiele method used for obtaining theoretical plates required for given degree of separation. **07**

(b) Define reflux ratio and explain in detail about optimum reflux ratio. **07**

Q.4 **(a)** Classify dryers used in industry. Explain construction, working, advantages, disadvantages and applications of tray dryer with neat sketch. **07**

(b) State and explain in brief various methods of generating supersaturation in case of Crystallization. **07**

OR

Q.4 **(a)** With the help of neat sketch, explain in brief Swenson-Walker Crystallizer. **07**

(b) Mention and explain the factors affecting the rate of drying. **07**

Q.5 **(a)** Explain minimum boiling and maximum boiling azeotropes with examples. **07**

(b) Explain rate of drying curve for both constant rate period and falling rate period. **07**

OR

Q.5 **(a)** Explain concept of freeze drying and its applications in biotechnology. **07**

(b) Write a short note on caking of crystals. **07**

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