

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012**

**Subject code: 160501****Date: 02/01/2013****Subject Name: Mass Transfer Operation-II****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain Raoult's Law and Azeotropic mixtures (maximum and minimum boiling)? **07**
- (b) Outline the McCabe-Thiele design method for obtaining number of theoretical trays by graphical method clearly mentioning its assumptions? **07**

- Q.2** (a) Explain the determination of economic (optimum) reflux ratio? **07**
- (b) Derive Rayleigh Equation for simple distillation? **07**

**OR**

- (b) 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

- Q.3** (a) Enlist the important terms used in humidification and define/explain any three of them? **07**
- (b) What is the selection criteria employed on the various types of cooling towers? **07**

**OR**

- Q.3** (a) A fractionation column has been installed to distillate 10000 kg/day of the mixture containing 40 % Benzene and 60% Toluene (by mol). The overhead and bottom products are found to contain 95 % benzene and 95% toluene respectively. Carry out overall material balance. **07**
- (b) Explain the use of enthalpy concentration diagrams? **07**

- Q.4** (a) Derive Fenske Equation? **07**
- (b) Explain the concept of wet-bulb temperature and adiabatic saturation Temperature? **07**

**OR**

- Q.4** (a) Explain with the sketch, the principle and working of fluidized bed drier? **07**
- (b) Explain with the sketch, the principle and working of rotary drier? **07**

- Q.5** (a) Write Freundlich equation? How is it applied to two-stage cross current adsorption? **07**
- (b) A porous solid is dried in a batch dryer under constant drying conditions. **07**  
Five hours are required to reduce the moisture content from 35 to 10%.  
The critical moisture content was found to be 14% and the equilibrium moisture 4%. All moisture contents are on the dry basis. Assuming that the rate of drying during falling rate period is proportional to the free moisture content, how long should it take to dry a sample of same solid from 35 to 6% under the same drying conditions?

**OR**

- Q.5** (a) Explain principles of ion exchange and describe its various techniques and application of ion exchange? **07**
- (b) Compare and contrast physical adsorption and chemisorptions? **07**

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