

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – SUMMER • 2014

Subject Code: 160501**Date: 19-05-2014****Subject Name: Mass Transfer Operations -II****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) What is an azeotrope? Write a brief note on azeotropic mixtures? **07**
 (b) What is reflux ratio? Write a note on different types of reflux ratio used in distillation? **07**

- Q.2** (a) Write in brief on Extractive distillation. **07**
 (b) Discuss in detail about Steam Distillation with example and compare it with vacuum distillation? **07**

OR

- (b) A liquid mixture containing 50 mole % n-Heptane and 50 mole % n-Octane is flash vaporized at 1 std atm. pressure and 30°C to vaporize 60 mole % of the feed. Compute the composition of liquid and vapor in the separator. Relative volatility of n-Heptane to n-Octane : 2.16 **07**

- Q.3** (a) What do you understand by quantity 'q'? Discuss location of 'q' line for typical feed condition in brief? **07**
 (b) 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.3** (a) What is constant molal overflow? Outline the McCabe-Thiele design method for obtaining number of theoretical trays by graphical method clearly mentioning its assumptions? **07**
 (b) Why are reboiler used in distillation? Which are the different types of reboiler used in industry? Draw neat sketch of any three types reboiler used? **07**

- Q.4** (a) A porous solid is dried in a batch dryer under constant drying conditions. Five hours are required to reduce the moisture content from 25 to 6%. 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 20 to 6% under the same drying conditions? **07**
 (b) Explain with the sketch, the principle and working of tray drier. **07**

OR

- Q.4** (a) A fractionation column has been installed to distillate 5000 kg/hr of a mixture of 50 % methanol & 50% water (by weight). The overhead and bottom products are found to contain 95 % methanol and 1 % methanol respectively. Carry out overall material balance. **07**
 Data: Mol. wt. of methanol: 32 and Mol. wt. of water: 18.
 (b) Derive Fenske Equation? **07**

- Q.5** (a) Explain the various types of cooling towers and discuss their selection criteria. **07**
 (b) Write Freundlich equation? How is it applied to two-stage cross current adsorption? **07**

OR

- Q.5** (a) Explain any five important terms used in psychrometric operation for air water mixtures. **07**
 (b) Explain with the sketch, the principle and working of rotary drier. **07**
