

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2160501****Date: 04/12/2019****Subject Name: Mass Transfer Operation - II****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

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

MARKS

- Q.1**
- (a) List assumptions of McCabe-Thiele method and its limitations. **03**
- (b) Write short note on adsorbents with their characteristics. Also state few industrial applications of adsorption. **04**
- (c) A mixture of 45 mol% Benzene and remaining Toluene is continuously fractionated in a tower. Feed is liquid at its boiling point and is introduced at 5 kmol/s rate. This gives 98 % benzene in distillate and 98 % toluene in bottoms. Find amount of Distillate and Bottoms. Find minimum reflux ratio and number of plates when total reflux is used. **07**
- Equilibrium data in mole fraction is given as:

x	1	0.78	0.58	0.41	0.26	0.13	0.017
y	1	0.9	0.78	0.63	0.49	0.26	0.039

- Q.2**
- (a) Explain constant pressure equilibria with neat sketch. **03**
- (b) With neat sketch, explain drum dryer. **04**
- (c) Carry out material balance for feed tray and derive equation for q line. How feed condition affects the q line? Draw and explain. **07**
- OR**
- (c) Give detailed classification of cooling towers and discuss about any one in detail with neat sketch. **07**
- Q.3**
- (a) Briefly explain freeze drying. **03**
- (b) Discuss about various types of adsorption. **04**
- (c) Define saturated humidity, Humid heat and humid volume. A gas (B)–benzene (A) mixture is saturated at 1 std atm, 50° C. Calculate the absolute humidity if B is (a) nitrogen and (b) carbon dioxide. Vapor pressure of nitrogen at 50°C is given as 0.362 std atm. **07**

OR

- Q.3**
- (a) Compare forced draft and induced draft cooling tower. **03**
- (b) Derive Rayleigh's equation for simple distillation. **04**
- (c) Write Freundlich equation and explain. Write material balance for a single stage adsorption and apply Freundlich equation in it. **07**
- Q.4**
- (a) Define reflux ratio. Explain total and minimum reflux. How reflux ratio affects the number of stages. **03**
- (b) Discuss about the factors which affects the drying. How is drying different than evaporation? **04**
- (c) Explain Extractive distillation by citing proper example. Also write requirements of solvent to be used in distillation. **07**

OR

- Q.4 (a) Define: Free Moisture, Grosvenor Humidity, Blowdown. **03**
 (b) Explain ideality and Raoult's law. Also discuss about positive deviation. **04**
 (c) Derive equation for Adiabatic Saturation Curve. **07**
- Q.5 (a) Briefly explain adsorption hysteresis. **03**
 (b) Write brief note on Pressure Swing Adsorption (PSA). **04**
 (c) A commercial dryer requires 6 hr to dry the moist material from 32 % to 8 % moisture on wet basis. The critical moisture content is 16 % (wet) and equilibrium moisture content is 0.05 kg moisture/kg dry solid. How much excess time is required to dry material from 37 % to 7 %, if the drying conditions remains the same. **07**
- OR**
- Q.5 (a) Discuss about range and approach with reference to cooling tower. **03**
 (b) Discuss the principle of Ion Exchange and its application. **04**
 (c) Derive equation for time required in constant and falling rate drying. **07**

www.FirstRanker.com