

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – WINTER • 2014****Subject Code: 143502****Date: 29-12-2014****Subject Name: Chemical Engineering Operation****Time: 02:30 pm - 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.

- Q.1** (a) 1. In _____ filtration, the rate of filtration decreases with time **07**
 (a) Constant pressure (b) Constant rate (c) Constant temperature (d) None
 2. What are the two types of adsorption?
 3. Define critical moisture content.
 4. Define capacity of an evaporator.
 5. The value of economy of single-effect evaporator is always _____.
 6. Separation by distillation is not possible when the value of relative volatility is _____.
 7. Define permeate.
- (b) Explain principle, construction and working of Rotary Drum filter. **07**

- Q.2** (a) Describe different types of solid mixers in brief and their applications. **07**
 (b) Draw a neat sketch of a packed column for absorption operation and write its construction and functioning. **07**

OR

- (b) A mixture of acetone vapor and air containing 5 % by volume is to be freed of its acetone by scrubbing it with pure water in an absorber. The flow rate of gas mixture is 30 kmol/hr of acetone-free air and that of water is 80 kmol/hr. If the scrubber absorbed 97% of the acetone, calculate the quantity of acetone absorbed and the driving force at the top and bottom of the absorber. The equilibrium relation for the acetone vapor –water system is $Y^* = 1.68 X$, where Y^* is kmol acetone/kmol dry air and X = kmol acetone/kmol water. **07**

- Q.3** (a) Explain with the sketch, the principle and working of tray drier. **07**
 (b) Describe the classification of crystallizer. Explain any one. **07**

OR

- Q.3** (a) Define adsorption, adsorbent and adsorbate. What the desired characteristics of a good adsorbent? **07**
 (b) Discuss the criteria for choice of solvent for liquid-liquid extraction. **07**

- Q.4** (a) Explain the differential distillation in detail. Derive Rayleigh equation for binary mixture. **07**
 (b) Describe the method of forward feed with neat sketch for a triple effect evaporator. **07**

OR

- Q.4** (a) Slabs of paper pulp $1\text{ m} \times 1\text{ m} \times 0.015\text{ m}$ is to be dried under constant from 66.7 % to 30 % moisture. The value of equilibrium moisture is 0.5 %. If the critical moisture content is 60 % and the rate of drying of critical point is $1.5\text{ kg}/(\text{hr m}^2)$, calculate the drying time. The dry weight of slab is 2.5 kg. Assume all moisture **07**

contents are on wet basis.

- (b) Define: reflux ration, total reflux ratio, minimum reflux ratio and optimum reflux ratio for distillation operation. **07**
- Q.5** (a) Discuss classification of evaporators and explain any one. **07**
(b) What is micro filtration? Discuss its industrial applications. **07**
- OR**
- Q.5** (a) What is reverse osmosis? State its applications. **07**
(b) Explain equilateral triangular coordinate and the mixture rule. **07**
