FACULTY OF ENGINEERING

PRINCE OF SONGKLA UNIVERSITY

Final Examination Paper : Semester II Academic year: 2008

Date : February 18, 2009 Time: 13.30-16.30

Subject: 230-302 Basic Chemical Engineering II Room: A 201

ทุจริตในการสอบโทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริตและพักการเรียน 1 ภาคการศึกษา

-There are a total 5 questions.

-The exam is open book.

-Place your name and the student ID number on every page.

-Students are allowed to use a pen or pencil and a calculator.

-No exams are allowed to leave the room.

Question	Points Value	Score
1	15	
2	25	
3	25	
4	25	
5	25	
Total	115	

PLEASE CHECK TO MAKE SURE THAT

YOU HAVE ALL 6 PAGES OF THE EXAM BEFORE BEGINNING.

(Including the cover sheet)

GOOD LUCK

Dr. Supawan Tirawanichakul

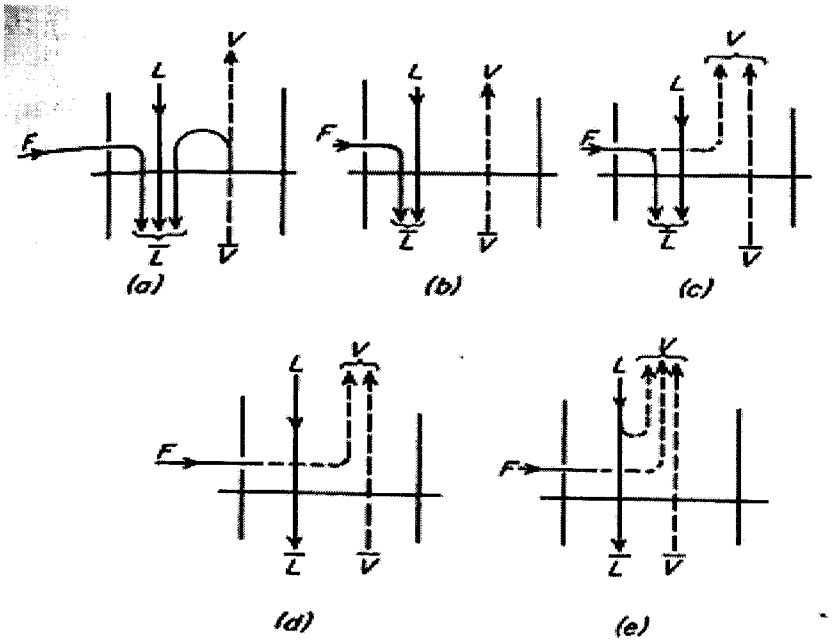
February 11, 2009

1. (15 points)
From the figure below, if F = 100 moles, L = 60 moles, and V = 80 moles, answer the following questions.

(a) Indicate the types of feed into the column and what is the approximate value of q for each of the feed?

(b) For case (b), what is the value of $\overline{L}$ and $\overline{V}$.

(c) For case (c), if f equals 0.65, what is the value of $\overline{L}$ and $\overline{V}$.



2. (25 points)
By mean of a plate column, acetone is absorbed from its mixture with air in a nonvolatile absorption oil. The entering gas contains 25 mole percent acetone, and the entering oil contains 1.5 mole percent acetone. Of the acetone in the air 90 percent is to be absorbed, and the concentrated liquor at the bottom of the tower is to contain 8 mole percent acetone. The equilibrium relationship is $y_e = x_e$
Calculate the number of ideal stage for this system.

3. (25 points) A flat slab of plastic 1800 cm^2 area and 15 cm thick is dried from both sides with dry-bulb temperature of 75°C and at wet-bulb temperature of 25°C. The air crosses parallel with the faces of the plastic at a velocity of 0.55 m/s. The density of the plastic is 950 kg/m^3. The equilibrium-moisture content is negligible. Find
(a) the drying rate during the constant-rate period
(b) drying time for this material to be dried from an initial moisture content of 45 percent (dry basis) to a final moisture content of 5 percent?

4 (25 points) A mixture of silica and galena is to be separated by hydraulic classification. The mixture has a size rang between 0.075-0.650 mm. The density of silica is 7500 kg/m^3, and the density of galena is 2550 kg/m^3. Find

(a) the water velocity is necessary for a pure galena product.

(b) the size range of pure silica or pure galena.

The viscosity of water at 25°C is 0.8937×10^{-3} kg/m.s

The density of water at 25°C is 997.08 kg/m^3

Assume the shape of silica and galena is sphere.

5 (25 points) In the primary refining of vegetable oils , a crude oil is partially saponified with caustic and the refined oil separated immediately from the resulting soap stock in a centrifuge. This process, the density of oil is 0.90 g/cm^3 and a viscosity of 20 centipoises, and the soap phase has a density of 0.99 g/cm^3 and a viscosity of 300 centipoises. It is proposed to separate these phases in tubular-bowl centrifuge with a bowl 30 in. long and 2 in ID. rotating at 18500 rpm. The radius of the dam over which the light phase flows is 0.50 in., whereas that over which the heavy phase flows is 0.55 in.

(a) Determine the location of the liquid-liquid interface within the centrifuge.

(b) If this centrifuge is fed at a rate of 45 gal/hr with feed containing 15 volume percent soap phase, what is the critical droplet diameter of oil held in the soap.