

Name Code 1

FACULTY OF ENGINEERING
PRINCE OF SONGKLA UNIVERSITY

Final Examination Paper : Semester II

Academic year: 2010

Date : February 17, 2010

Time: 13.30-16.30

Subject: 230-302 Basic Chemical Engineering II

Room: Robot

ทูลจริตในการสอบโทษขันต่ำ คือ ปรบัตคในรายวิชาที่ทูลจริตและพัทการเรียน 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 7 PAGES OF THE EXAM BEFORE BEGINNING.

(Including the cover sheet)

GOOD LUCK

Dr. Supawan Tirawanichakul

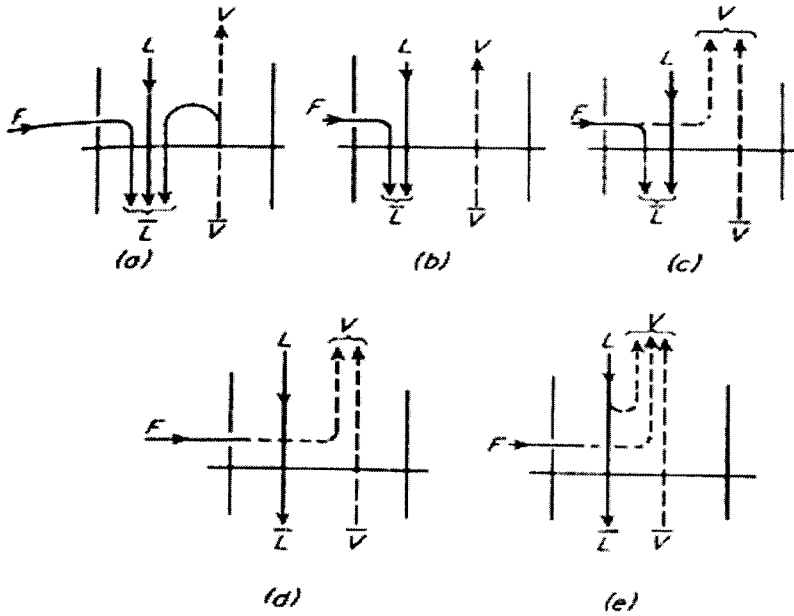
February 10, 2010



1. (15 points)

From the figure below, if $F = 200$ moles, $L = 120$ moles, and $V = 160$ moles, answer the following questions.

- Indicate the types of feed into the column and what is the approximate value of q for each of the feed?
- For case (b), what is the value of \bar{L} and \bar{V} .
- For case (c), if f equals 0.50, what is the value of \bar{L} and \bar{V} .



2. (25 points)

A mixture of 50 mole percent benzene and 50 mole percent toluene is subjected to flash distillation at a pressure of 1 atm. The vapor-liquid equilibrium curve and boiling-point diagram are shown in Figs. 1 and 2.

- (a) What is the composition of the liquid and vapor leaving the separator if f , the fractional vaporization is 0, 0.3, 0.5, 0.7 and 1?
- (b) What is the temperature in the separator?
- (c) Would the number of moles in the vapor phase increase or decrease if you increase the mole fraction of benzene? Explain

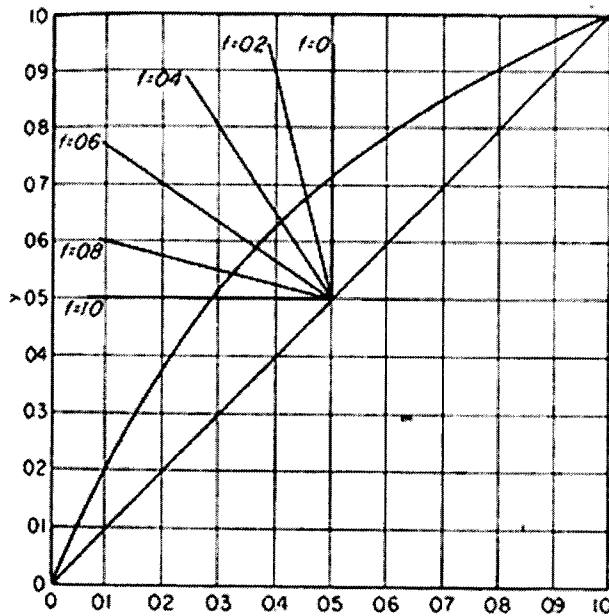


Figure 1 Equilibrium curve, system benzene-toluene

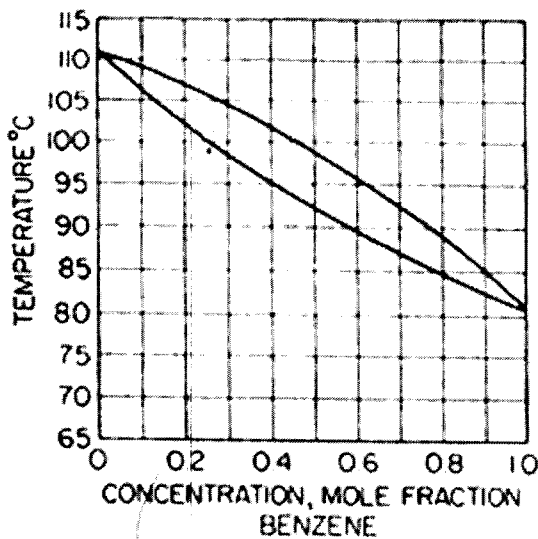


Figure 2 Boiling-point Diagram (system benzene-toluene)

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3. (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 $y_e = 1.9x_e$
Calculate the number of ideal stage for this system.

4. (25 points) A filter cake 60 cm square and 5 cm thick, supported on screen, was dry at dry-bulb of 65°C and at wet-bulb temperature of 27°C. The air crosses flows the cake at velocity of 1.1 m/s. The dry density of cake is 1950 kg/m³. 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 40 percent (dry basis) to a final moisture content of 3 percent?

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5 (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/m³, and the density of galena is 2550 kg/m³. 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/m³

Assume the shape of silica and galena is sphere.