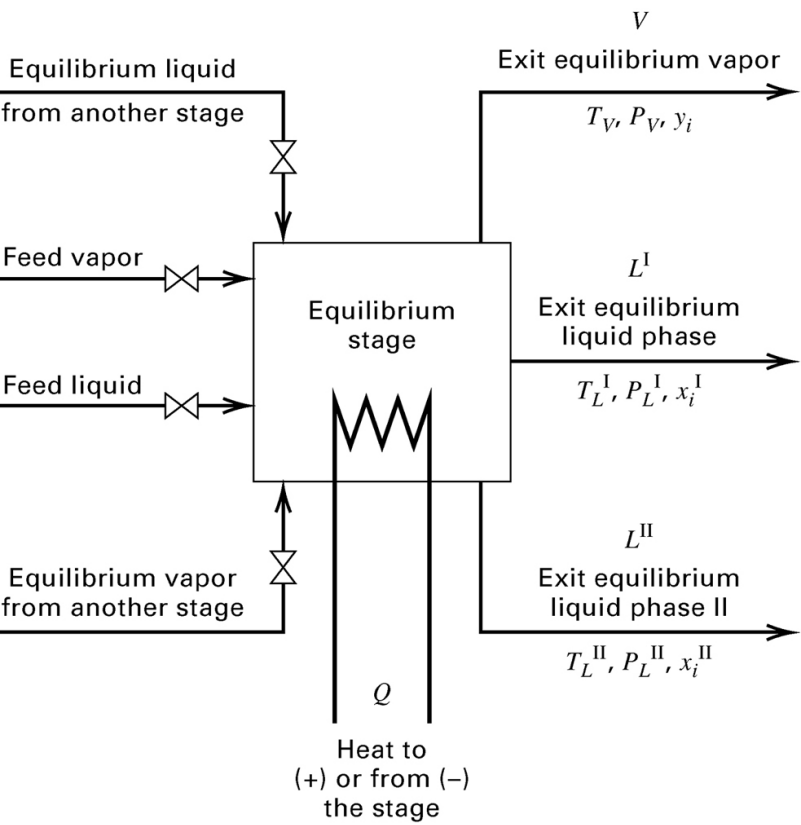# HW 5

Problem 2

Problem 2.1

List and count the variables in the system.

The following table lists all the variables in the system where $p = 2$. | Variable|#| | ----------- | ----------- | | Feed flow rates | 4 | | Outlet flow rates | 3 | |Q|1| |Equilibrium composition,x_i, y_i|cp| |Liquid feed composition, x_i|2c| |Vapor feed conposition, y_i|2c| |Outlet vapor composition, y_i^{out}|c| |Outlet liquid composition, x_i^I, x_i^{II}|2c| |Feed T|4| |Feed P|4| |Equilibrium T|1| |Equilibrium P|1| |Outlet P|3| |Outlet T|3|

The total number of variables is $9c + 24$.

Problem 2.2

List and count the independant equations governing the system.

Equation	#
Material balance	c
Energy balance	1

Equation	#
$\Sigma x_i = 1$ for feed, equilibrium, and outlet	5
$\Sigma y_i = 1$ for feed, equilibrium, and outlet	4
$k_i=\frac{y_i}{x_i}$	c(p-1)
Equation of state	c

The total number of equations is $3c + 10$

Problem 2.3

Calculate degrees of freedom. </br></br> DoF = # of variables - # of equations $\therefore$

$$DoF = 6c + 14$$