CHE 362 **HW #12** **Due 6/27/23**

Acetone is to be extracted from water using trichloroethylene (TCE) at 25°C and 1 atm.

#1 Create a right triangular diagram in Excel for the system water-acetone-TCE at 25°C and 1 atm using the data generated with Aspen. Include left and right conjugate lines on your diagram. Make sure your graph has major and minor grid lines in both the horizontal and vertical directions.

#2 Suppose a single concurrent extraction stage is used. The feed enters at 25°C a rate of 200 kmol/hr and has composition of 20 mol % acetone. Pure TCE is available as the extract solvent.

a) For an extract solvent feed rate equal to the raffinate feed rate, find the compositions and flow rates of the two streams leaving the extractor. Show your solution on the right triangular diagram.
b) For an extract solvent feed rate equal to 3 times the raffinate feed rate, find the compositions and flow rates of the two streams leaving the extractor. Show your solution on the right triangular diagram.
c) Suppose you want the raffinate to leave the extractor at 5 mole% acetone. What solvent feed rate do you need? Show your solution on the right triangular diagram.
d) Simulate part d) using a FLASH3 unit in Aspen and the solvent feed rate you calculated. Compare the mole fraction of acetone in the exiting raffinate stream with the specified value. Submit a copy of the stream table from Aspen showing the mole fractions.

LLE Data for Water-Acetone-TCE at 25 C					
Mole fractions Water Phase			Mole fractions TCE Phase		
TCE	Acetone	Water	TCE	Acetone	Water
0.001	0.000	0.999	0.999	0.000	0.001
0.001	0.026	0.973	0.907	0.091	0.002
0.001	0.054	0.945	0.812	0.183	0.005
0.002	0.084	0.914	0.713	0.275	0.013
0.003	0.118	0.879	0.608	0.365	0.026
0.004	0.156	0.840	0.497	0.452	0.051
0.007	0.202	0.791	0.378	0.528	0.095
0.011	0.264	0.725	0.247	0.578	0.174