CHE 362 **HW #9** **Due 6/20/23**

A mixture of 30 mol% toluene and 70% ethylbenzene is to be separated in a distillation column operating at 1 atm pressure. The feed enters as a saturated liquid at a rate of 500 kmol/hr. The distillate is to leave at 99 mole % toluene and the residue at 1 mole % toluene.

a) Calculate the flow rate of the distillate and residue in kmol/hr.

b) Determine the minimum reflux ratio and minimum number of stages.

c) Determine the number of ideal trays and location of the feed tray for a reflux ratio of 1.2 times the minimum.

d) Determine the heat duty of the condenser for part c).

#2 Now suppose the feed enters as a saturated vapor at a rate of 500 kmol/hr

e) Determine the minimum reflux ratio.

f) Determine the number of ideal trays and location of the feed tray for a reflux ratio of 1.2 times the minimum.

#3 A mixture of 20 mole% isopropyl alcohol (IPA)/80% water is to be separated in a distillation column operating at 1 atm pressure. The feed enters as a saturated liquid at a rate of 100 kmol/hr. The distillate is to leave at 65 mole % IPA and the residue at 1 % IPA.

b) Calculate the flow rate of the distillate and residue in kmol/hr.

c) Determine the minimum reflux ratio and minimum number of stages.

d) Determine the number of ideal trays and location of the feed tray for a reflux ratio of 1.5 times the minimum.

Note that for this problem you will have to expand the upper part of the x-y diagram in order to get an accurate count of the number of stages.