CHBE 470
Fall 2022
Homework 2

Assigned Monday, September 5, 2022
Homework due Friday, September 9 by 5:00 PM

Read Chapters 1 - 3 in the textbook and answer the following questions:

Problem 1 - 10 points In this problem we will analyze a stirred tank chemical reactor with three reagents: A, B, and C. The reactions for this system are given below, with all reactions first order with the rate constants shown: the rate of the second reaction is $k_B C_B$ in the forward direction and $k_C C_C$ in the reverse direction.

$$A \xrightarrow{k_A} B \underset{k_C}{\overset{k_B}{\rightleftharpoons}} C$$

Only component A enters in the feed, and B and C are produced in the reactor. The reactor was initially at steady-state operation before a step change in the inlet concentration of A occurs.

Formulate a model of the process. You should end up with a set of 3 differential equations.

Solve the appropriate differential equation for the concentration of A in the reactor (C_A) after a step in the inlet concentration of size ΔC_{A0}. You can solve for the deviation variable $C'_A = C_A - C_{AS}$ **You ONLY need to solve for C_A not C_B or C_C**

Problem 2 - 10 points Problem 3.15 in Marlin. Only solve parts a - c of this problem.