Pre-lab 7

1. The overall purpose of this lab is to introduce the concept of trajectory following along with feedback control, for use in applications where vibrations/surges must be eliminated, or where very specific motions are necessary. Moreover, learning trajectory control helps us work with more realistic and responsive regulator signals for fast responses. This will have applications in industrial robotics, defense systems, etc.

2. a.) The FF flag helps direct the program to the trajectory following behavior as opposed to simple command following behavior for the regulator.

   b.) I added a multiplier of 5 to vary P2 such that P2 = 5*10*pi. On doing so, there was a sever disparity in the intended input reference signal (BLUE) and the output behavior of the system (RED). The input signal suddenly turned to having steep changes in position, where there was a phase shift and magnitude reduction in the measured output signal, the speed was changing opposite to what the input signal required, and the voltage level was also entirely out of phase. Moreover, the Dc current drawn was significantly higher than the input current, and the torque was unstable with large variations in speed.

   c.) I divided Sc by a factor of 10 to vary it. On doing so, a delay was introduced when the system was trying to adapt to the reference signal for position, the input speed reference signal was almost constant – any changes in input reference velocity caused an opposite large variation in output. Same behavior for voltage. Further, output DC current was much larger, and torque band-with shrunk in magnitude.

   d.) I multiplied AC by 10. On doing so, the first 3 plots (position, velocity, voltage) were closer t their input reference signals. The DC current response was a scaled inversion of the input, and the torque bandwidth expanded with a shrinkage in magnitude.

   e.) On multiplying T by 5, there were sharper changes in the input reference signal causing greater disturbances in all the output measured signals. The speed and voltage signals saw greater underdamped behavior (more overshoots), DC current magnitude was greater, and there were much more changes in torque per unit time.