Prelab 8

1. The overall purpose of this lab to learn how to control AC motors with non-linear models, using the DQ model which is a linearized approximation for the AC motor control model. It's unique in the fact that we learn how to use half-bridges to control the AC motor with 3 connections as opposed to using H-bridges with 6 connections to do the same. Using 3 unique PWM signals for controlling the 3 phases of a motor is again a new experience.

2. A start-up procedure with an encoder is important here to measure the rotor position so that we can rely on the fact that the rotor will tend to settle into specific fixed positions for constant excitation.

3. a.) In steady state too, the system has some small bumps (oscillations) which may occur due to the lack of material homogeneity causing rotor permanent magnets being attracted to the stator spokes than the stator slots, OR, due the the -Fw term spoken of in class.

   b.) It takes about 0.05s for the system to reach steady state. Lambda-r is the regulator bandwidth. Decreasing it increases the settling time, and increasing it decreases the settling time.

   c.) Peak voltage is around +17.5V and trough is at about 7V (visual observation of plot)

   d.) From simulation code:
   Peak power: Approx. V*I = 24W (24V * 1A)
   Peak Current: max of i_dc is 1A

   e.) The max value of U is Vmax (pre-lab reading page 8): Theoretically it is 24V, but from simulation it is about 11.68V.