The objective of this experiment is to determine the operating characteristics of an induction motor at several voltages.

**Laboratory Equipment:**

This lab will make use of:

1)  Slip Ring Motor (Wound Rotor Induction Machine)
2)  Variable Frequency Induction Motor Drive
3)  dc dynamometer
4)  Resistive load cart
5)  Various instruments

The nameplate on the induction machine that we will be using in the lab says Slip Ring Motor. It has a wound rotor; the rotor windings are made with wire instead of using a cage made of cast aluminum as in a squirrel cage rotor. The windings are connected to slip rings (thus the name). Brushes ride on the slip rings, giving an external electrical connection. This allows us to make measurements on the rotor circuit. We will take advantage of this to measure the rotor resistance. A squirrel cage rotor is inaccessible, making the determination of the rotor resistance much more difficult. The rotor resistance is probably the most important parameter in the induction motor equivalent circuit since it has the most effect on the machine’s performance. This is discussed in further detail in the reading assignment below.

A dynamometer is used to measure the torque. The scale gives a reading in pounds and the arm is 1 foot long. The torque in foot-pounds is read directly from the scale. The dynamometer also has a tachometer to measure the speed, thus giving a measurement of power (power = torque * speed). For power in watts the torque must be in newton-meters and the speed in radians/sec.

The induction motor and the dynamometer will be physically connected together, allowing the induction motor to turn the dynamometer. The dynamometer will operate as a dc generator. By varying the load on the generator (the dynamometer), the load on the induction motor can be changed. The two machines are powered through the large cable hanging underneath the bench. (See the figures for the first lab.) Each of these cables are colored coded (blue or yellow) which match the machinery connection panel on the bench. The smaller cable is also connected to the dynamometer. This connects the tach to the bench.

The lab will involve measuring the speed and torque at different loads in order to plot the torque as a function of speed. This will be repeated at several voltages.

We will also be using a variable frequency drive (manufactured by Baldor). You’ve seen this on your lab bench all term. Basically, a 208-V 3-phase voltage is input, rectified to DC, and then “inverted” to a 3-phase AC voltage of the desired frequency and magnitude. Controlling an induction motor with such a drive allows us to gradually start high-torque loads without drawing a huge surge of current, and lets us vary the speed and torque over a wide range to match a specific mechanical load. Motor direction can also be easily reversed (by changing phase sequence). The down side to these drives is that the power electronics devices will draw harmonically distorted current from the source, and provides a harmonically distorted voltage to the motor. Next quarter in EE 380, we will discuss “power quality problems” related to use of these drives.

**To Do:**

1)  Read sections 8.3 and 8.4 of the text. Pay particular attention to figure 8.11, pg. 287. You will be testing machines to find the portion of the torque speed curve to the right of the maximum torque point.
2)  Bring this document, the lab procedures document, lab #1, and the lab policy document to the lab.