

Make sure, for **all** parts of **all** problems, show your work.  
Partial credit cannot be given without you showing your work.

Make sure all of your values have units (ohms, volts, amps, VA, W, VAR, etc.)

A utility provides a three phase voltage source of 480V at 60 Hz.  
It is shown in phasor notation as  $480\angle 0^\circ$ .

Plot the following:

Show the plot of the open circuit voltage versus time on a graph. Be sure to clearly indicate the peak and RMS values and the period of the waveforms. Be sure to show all three phases on the same graph. Show two waveform periods of time on the graph.

Connect the utility to a variable frequency drive (VFD) that controls the speed of a motor with PWM. We need to find the value of the (DC) voltage on the DC bus.

Plot the following:

Show the plot of the rectified voltage versus time on a graph. Show all three phases. Be sure to clearly indicate the peak and RMS values of each and the period of the waveforms. Show two waveform periods of time on the graph.

The three phase voltage provides 20A of (line) current to the motor at full speed. This equates to 20A of current from the utility into the VFD.

If the utility has a problem and loses one of the three phases (continues to run on only two phases), what is the current into the VFD? Prove this.