EE 313 –Design Problem Last names between I and P
Fall 2010
Due Tuesday, November 23rd.
Accepted without penalty by November 30th.

A balanced, three-phase, Y-connected source has a line voltage of 250 Vrms. The source
frequency is 60 Hz. The balanced, three-phase loads have the following characteristics:

$Z_{\Delta 1}$: $P_1 = 45$ kW and $Q_1 = +63$ kVAR
Z_{y2}: $4\angle 35°\ \Omega$
$Z_{\Delta 3}$: $PF_3 = 0.15$ lagging and $I_{p3} = 100$ A rms
Z_{y4}: $\mathbf{S_4} = 15\angle 50°$ kVA

  1. Determine the phasor value of each impedance and the current for each load.

  2. Determine the total line current, $\mathbf{I_{aA}}$.

  3. Determine the total complex power, average power, and reactive power delivered by the
      source to the loads.

  4. What is the power factor of the three loads combined?

  5. It is necessary to add a parallel load in the Y configuration to the circuit to reduce the
      magnitude of the line current by 50%. The line voltage and total average power delivered
      by the source may not change. What are the impedance and the component value of this
      load?

  6. What is the power factor of the additional load?

  7. What is the power factor of the four loads combined?