**Homework 2**

**ECE 207 – Electrical Engineering**

**Due: 9/13/2012**

1. A balanced three-phase wye-connected generator has an internal impedance of Zgen = 0.2 +

j0.5 Ω. The internal voltage of the generator is 120 V per phase. The generator feeds a

balanced three-phase wye-connected load having an impedance of Zload = 39 + j28 Ω. The

impedance of the line connecting the generator to load is Zline = 0.8 + j1.5 Ω. Calculate:

* 1. **Van**, **Vbn**, and **Vcn** at the terminals of the generator in phasor form (polar form)
  2. **Vab**, **Vbc**, and **Vca** at the terminals of the generator in phasor form (polar form)

1. A three-phase motor draws 20 kVA at 0.8 lagging power factor from a 220 V source. If the

motor is wye-connected, calculate:

* 1. Three-phase power P in kW
  2. Single-phase power P in kW
  3. Three-phase reactive power Q in kVAR
  4. Single-phase reactive power Q in kVAR
  5. Three-phase complex power **S** in kVA
  6. Single-phase complex power **S** in kVA
  7. Line and phase currents for each line and phase in Amps

1. Repeat Problem 2, if the motor is delta-connected. Also, it is desired to improve the power

factor to 0.9 lagging by connecting a three-phase wye-connected capacitor bank across the

terminals of the motor. Determine the required three-phase kVAR rating of the capacitor

bank.

1. A 345 kV transmission line delivers 500 MVA, 0.866 lagging power factor to a three-phase

wye-connected load. The line impedance that connects the wye-connected source to the load

is Zline = 0.5 + j1.5 Ω, and the load terminal voltage is 345 kV. Calculate:

* 1. Line and phase currents in Amps for one phase only
  2. Source line and phase voltages in kV for one phase only
  3. Voltage regulation and efficiency

1. Repeat Problem 4, if the load is delta-connected.