

# ECE 476 – Power System Analysis Fall 2012

## Homework 1

**Due Date:** Thursday September 6, 2012

**Reading:** Chapters 1 and 2 of GS&O

**Problem 1.** With  $|V| = 100$  V, the instantaneous power  $p(t)$  into a network  $N$  has a maximum value 1707 W and a minimum value of -293 W.

1. Find a possible series  $RL$  circuit equivalent to  $N$ .
2. Find  $S = P + jQ$  into  $N$ .
3. Find the maximum instantaneous power into  $L$  and compare with  $Q$ .

**Problem 2.** A certain  $1\phi$  load draws 5 MW at 0.7 power factor lagging. Determine the reactive power required from a parallel capacitor to bring the power factor of the parallel combination up to 0.9.

**Problem 3.** A  $3\phi$  load draws 200 kW at a PF of 0.707 lagging from a 440-V line. In parallel is a  $3\phi$  capacitor bank that supplies 50 kVAr. Find the resultant power factor and current (magnitude) into the parallel combination.

**Problem 4.** A  $1\phi$  load draws 10 kW from a 416-V line at a power factor of 0.9 lagging.

1. Find  $S = P + jQ$ .
2. Find  $|I|$ .
3. Assume that  $\angle I = 0$  and find the instantaneous power  $p(t)$ .

**Problem 5.** A small manufacturing plant is located 2km down a transmission line, which has a series reactance of  $0.5 \Omega/\text{km}$ . The line resistance is negligible. The line voltage plant is  $480\angle 0$  V (rms), and the plant consumes 120 kW at 0.85 power factor lagging. Determine the voltage and power factor at the sending end of the transmission line by using:

1. A complex power approach.
2. A circuit analysis approach.