ECE 476 – Power System Analysis Fall 2017
Homework 1

In-class quiz: Thursday, September 7, 2017
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 1ϕ 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 3ϕ load draws 200 kW at a PF of 0.707 lagging from a 440-V line. In parallel is a 3ϕ capacitor bank that supplies 50 kVAr. Find the resultant power factor and current (magnitude) into the parallel combination.

Problem 4. A 1ϕ 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 Ω/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.