

ECE 476 – Power System Analysis Fall 2017

Homework 6

Reading: Chapter 6.

In-class quiz: Tuesday October 17, 2017

Problem 1. Compute the elements of the **third** row of Y_{bus} for the power system in Example 6.9 of textbook.

Problem 2. Given the impedance diagram of a simple system as shown in Figure 1, draw the admittance diagram for the system and develop the 4 x 4 bus admittance matrix Y_{bus} by inspection.

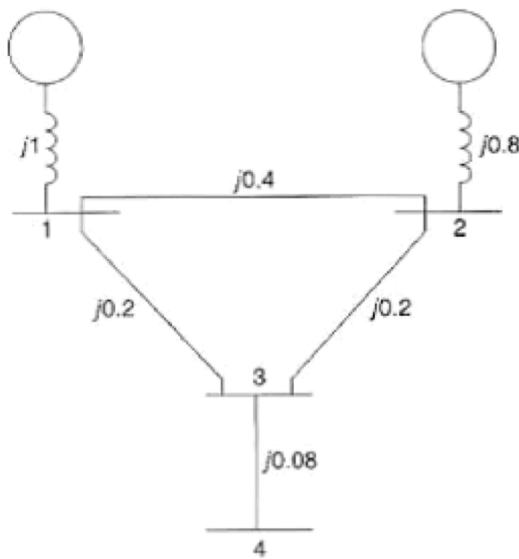


Figure 1: System diagram for problem 2.

Problem 3. A load L consuming 1 p.u. of active power and 0.5 p.u. of reactive power is connected to a generator $G1$ through a short transmission line with $Z' = 0.02 + j0.06$ p.u. Also, there is a capacitor connected to the load bus with admittance $Y_{cap} = j0.25$ p.u. The generator voltage is voltage $V_{G1} = 1\angle 0$.

- Draw the one line diagram of this system indicating clearly all the elements referenced above.
- Write the admittance matrix Y_{bus} for this system.
- Write the power flow equations for this system. **DO NOT SOLVE!**

Problem 4. Solve the following equation by the Newton-Raphson method:

$$\begin{aligned} 2x_1^2 + x_2^2 - 8 &= 0 \\ x_1^2 - x_2^2 + x_1x_2 - 4 &= 0 \end{aligned}$$

Start with an initial guess of $x_1 = 1$ and $x_2 = 1$.

Problem 5. Assume a $1 + j0.5$ per unit load at bus 2 is being supplied by a generator at bus 1 through a transmission line with series impedance of $0.05 + j0.1$ per unit. Assuming bus 1 is the swing bus with a fixed per unit voltage of $1.0\angle 0$, use the Newton-Raphson method to calculate the voltage at bus 2 after two iterations.