ECE 476 – Power System Analysis Fall 2012
Homework 8

Due Date: Tuesday November 6, 2012

Problem 1. Problem 6.41 in textbook
Problem 2. Problem 6.43 in textbook. Be sure to write out the power flow equations and the Jacobian both analytically/symbolically and numerically for each step of the iteration.
Problem 3. Solve the following equation by the Newton-Raphson method:

$$2x_1^2 + x_2^2 = 8$$
$$x_1^2 - x_2^2 + x_1 x_2 = 4$$

Start with an initial guess of $x_1 = 1$ and $x_2 = 1$ and show work for four iterations. After working out this problem by hand, write a MATLAB script to solve this problem and turn in the code and the output.

Problem 4. This problem requires you to compute a solution in MATLAB again. Consider the system shown in Figure 1, which was discussed in class. First suppose $V_1 = 1$, $\theta_1 = 0°$, $V_2 = 0.95$, $P_2 = 1.5$, and $X_l = 0.2$ (all in p.u.). Iterate θ_2 until it converges using the Newton-Raphson MATLAB code written in Problem 3. Use initial guess of 0°, 60°, and 90° for θ_2 and comment on the results. Note that this is a scalar case of Newton Raphson. Finally, note that in a realistic load bus, the voltage is a variable and is not fixed.

Now consider the more realistic case of having only V_1 is fixed and V_2 being a variable. The other parameters are same as above and $Q_2 = 0.15$. Find θ_2 and V_2 with initial guesses of 0° and 1, respectively, using MATLAB (this is a vector case of N-R). Turn in the MATLAB code and the outputs.

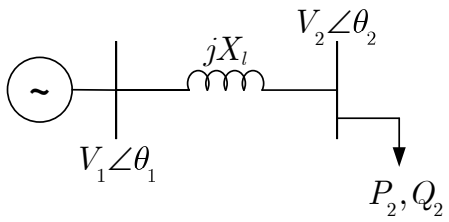

Figure 1: System diagram for problem 4.