ECEN 615 Problem Set #6 Fall 2018

Due 11/29/18

1. For the losseless two bus system from lecture 22, pick a value of P_L = 4 + (last two digits in your UIN/100) and determine the associated value of Q_L that is on the solvability boundary Σ. First, calculate the power flow solution associated with this boundary point. Next, calculate the normal to the boundary in parameter space. Then, use the normal to change the load slightly moving into the solvable region. Determine the two power flow solutions associated with this point. Give the two solutions, and comment on how they relate to the boundary point power flow solution and then right eigenvector associated with the zero eigenvalue of the boundary point.

2. In PowerWorld using the Bus37_PV system first open two transmission lines and one generator. You may choose any two lines, except with the requirement that you not isolate any load or island the system. For the generator you may open any one, excepting the slack bus generator. Then, use the **Load Scalar** field to increase the system load until the system reaches voltage collapse. Plot the PV curve, with P being the total system load, and V being the voltage magnitude at the bus that has the lowest voltage magnitude at the point of voltage collapse. Your PV curve should have at least ten fairly uniformly spaced points.

3. In PowerWorld using the GIC_20BusTestCase open one generator of your choice. Then determine the maximum GMD uniform electric field value with zero degrees before voltage collapse occurs; use a 0.5 V/km resolution. Repeat with 90 degrees.

4. Book problem 8.3. You can do this in PowerWorld using the provided WWS_6Bus case. Note the results on page 271 are with the line between buses 1 and 4 out-of-service. You should solve it with the line in-service.