ECE 667 Homework 2
Due Thursday September 19, 2019

1.   A new 3 phase, 60 Hz transmission line is to be built using Falcon conductor. Falcon conductor has an outside diameter of 1.545 inches; stranding of 54/19 (Al/St), which yields a GMR for the conductor of 0.0523 feet. Resistance at 60-Hz is 0.0612 Ω/mile. The tower to be used has the three conductors in a horizontal configuration with the phase conductors 40 feet above the ground and spaced 12 feet apart (i.e., from left to center is 12 feet, center to right is 12 feet, and left to right is 24 feet). Fifteen feet above the phase conductors are two ground conductors, one 7 feet to the left of center and one 7 feet to the right of center. The ground wires use Partridge conductors, with an outsider diameter of 0.642 inches and a GMR of 0.0217 feet. Resistance at 60-Hz is 0.350 Ω/mile. Assume ground resistivity of 120 Ω-m.

   a.   Using the approach discussed in class, calculate the three by three phase impedance matrix, in Ω/mile.
   b.   Using your result from part a, calculate the three by three sequence impedance matrix.

2.   Using PowerWorld with case wscc_9bus_WithGovernors change the contingency from opening the bus 3 generator to opening the load at bus 6. Over the course of the 20 second simulation what is the highest bus frequency and what is the final bus frequency (to 0.01 Hz)?

3.   Using PowerWorld with AGL37_TS change the contingency to a self-clearing, zero impedance, three-phase fault at bus CENTURY69. Determine the maximum fault duration if there is a requirement that no generator speed exceed 60.3Hz. What is the maximum fault duration before a generator loses synchronism?

4.   Book problem 3.2

5.   Book problem 3.4