ECE 476 – Power System Analysis Fall 2012
Homework 4

Due Date: Tuesday October 2, 2012

Problem 1. A 60-Hz three-phase, three-wire overhead line has solid cylindrical conductors arranged in the form of an equilateral triangle with 4 ft conductor spacing. Conductor diameter is 0.5 in. Calculate the positive-sequence inductance in H/m and the positive-sequence inductive reactance in Ω /km.

Problem 2. Calculate the capacitance-to-neutral in F/m and the admittance-to-neutral in S/km for the three-phase line in Problem 1 **(stated above)**. Neglect the effect of the earth plane.

Problem 3. Rework Problem 2 if the phase spacing is:
a) Increased by 20% to 4.8 ft.
b) Decreased by 20% to 3.2 ft.
Compare the results with those of Problem 2.

Problem 4. A 500-km, 500-kV, 60-Hz uncompensated three-phase line has a positive-sequence series impedance z=0.03+j0.35 Ω/km and a positive-sequence shunt admittance y=j4.4 x 10^{-6} S/km. Calculate:
(a) Z_c
(b) (γl)
(c) The exact ABCD parameters for this line.

Problem 5. A 320-km 500-kV, 60-Hz three-phase uncompensated line has a positive-sequence series reactance x=0.34 Ω/km and a positive-sequence shunt admittance y=j4.5 x 10^{-6} S/km. Neglecting losses, calculate:
(a) Z_c
(b) (γl)
(c) The exact ABCD parameters for this line.
(d) The wavelength λ of the line, in kilometers.
(e) The surge impedance loading in MW.