

ECE 476 – Power System Analysis Fall 2017

Homework 3

Reading: Chapter 4 from textbook.

In-class quiz: Thursday, September 21, 2017

Problem 1. A 60-Hz single-phase, two-wire overhead line has solid cylindrical copper conductors with 1.5 cm diameter. The conductors are arranged in a horizontal configuration with 0.5 m spacing. Calculate in mH/km:

- The inductance of each conductor due to internal flux linkages only.
- The inductance of each conductor due to both internal and external flux linkages.
- The total inductance of the line.

Problem 2. Rework Problem 1 if the diameter of each conductor is:

- Increased by 20% to 1.8 cm.
 - Decreased by 20% to 1.2 cm, without changing the phase spacing.
- Compare the results with those of Problem 1.

Problem 3. 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 4. Calculate the capacitance-to-neutral in F/m and the admittance-to-neutral in S/km for the three-phase line in Problem 3 (**stated above**). Neglect the effect of the earth plane.

Problem 5. Rework Problem 4 if the phase spacing is:

- Increased by 20% to 4.8 ft.
- Decreased by 20% to 3.2 ft.

Compare the results with those of Problem 4.