Homework #3: Due on Tuesday, February 20th Before the Class

Readings: 4.1-4.6; 4.8-4.10

3.1 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 inductance in H/m and the inductive reactance in Ω/km.

3.2 Rework on above problem 3.1 in this homework, if the conductor diameter is
a). increased by 20% to 0.6 in, without changing the phase space
b) decreased by 20% to 0.4 in, without changing the phase space

Compare the results with those in problem 3.1.

3.3 Determine the GMR of each of the unconventional stranded conductors shown in below Figure 3.1. All strands have the same radius r.

![Figure 3.1 Figure for Problem 3.3](image)

3.4 The conductor configuration of a bundled single-phase overhead transmission line is shown in below Figure 3.2. Line X has its three conductors situated at the corners of an equilateral triangle with 10-cm spacing. Line Y has its three conductors arranged in a horizontal configuration with 10-cm spacing. All conductors are identical, solid-cylindrical conductors. Each with a radius of 2 cm. Find the geometric mean radius of each bundle and the geometric mean distance.
3.5. Below Figure 3.3 shows the conductor configuration of a completely transposed three-phase overhead transmission line with bundled phase conductors. All conductors have a radius of 0.74 cm with a 30-cm bundle spacing. The line is operating at 60 Hz. Determine (a) the inductance per phase in mH/km and in mH/mi. (b) the inductive line reactance per phase in Ω/mi at 60 Hz. (c) the line-to-neutral capacitance in F/km per phase and in F/mi per phase. (d) the admittance in S/km per phase and in S/mi per phase.