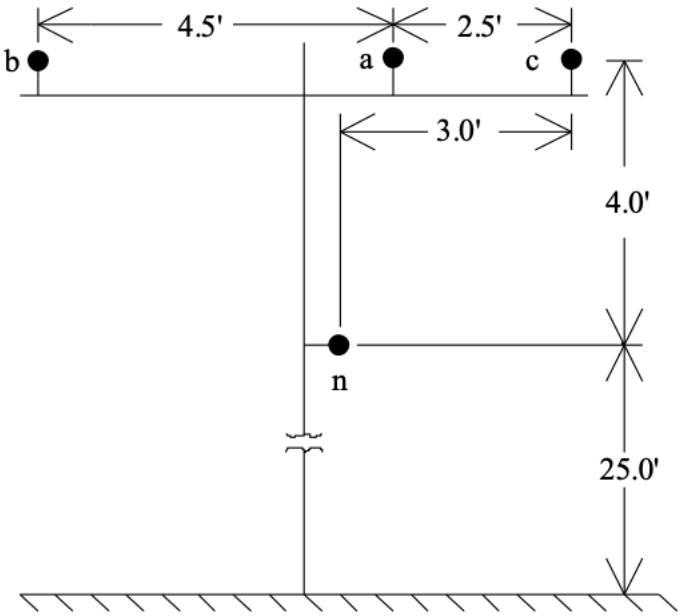
ECE 1710 – Power Distribution and Smart Grids
Approximate Methods

1. Determine the positive sequence impedance for the following transmission line



The phase conductors are 397, 500 cmil, 26/7 ACSR conductors and the neutral is a 4/0, 6/1 ACSR conductor.

Using MATLAB

phase_cond.r = 0.3;
phase_cond.GMR = 0.0818;

zpos = transposedLineImpedance(phase_cond,f)

$$z_{pos} = 0.3 + j0.75\ \Omega/mi$$

2. Repeat problem 1 using all aluminum conductor instead of ACSR. Comment on the difference. Also, comment on why one conductor would be selected over the other
3. A 2400 V lateral has the following loads

$$S_1 = 20\ kW + j10\ kvar$$

$$S_2 = 10\ kW + j8\ kvar$$

$$S_3 = 12\ kW + j7\ kvar$$

$$S_4 = 18\ kW + j7\ kvar$$

$$S_5 = 10\ kW + j12\ kvar$$

$$S_6 = 20\ kW + j15\ kvar$$

$$S_7 = 20\ kW + j12\ kvar$$
$$S_8 = 10\ kW + j10\ kvar$$

Using the the positive sequence per-phase impedance determined in problem 1, the line lengths between loads are

$$L_{12} = 1000\ ft.$$

$$L_{23} = 800\ ft.$$

$$L_{34} = 1000\ ft.$$

$$L_{45} = 1200\ ft.$$

$$L_{56} = 500\ ft.$$

$$L_{67} = 1500\ ft.$$

a. Using a linear ladder network please calculate the voltage at each node, the current supplied to the network, and the Vdrop percent from source to load 7.
b. Repeat this using the nonlinear iterative power flow solution.