ECE 523: Homework #2

Due Session 8 (September 19)

1. Determine the symmetrical components for the following currents and sketch a phasor diagram, based on

(a) Phase "a" referenced components  
(b) Phase "b" referenced components  
(c) Phase "c" referenced components

\[I_A := 0A \cdot e^{0\text{deg}}\]
\[I_B := 0A \cdot e^{-j \cdot 120\text{deg}}\]
\[I_C := 2500A \cdot e^{j \cdot 30\text{deg}}\]

2. Repeat problem 1. with the following currents:

\[I_A := 4500A \cdot e^{-j \cdot 25.84\text{deg}}\]
\[I_B := 8503A \cdot e^{-j \cdot 229.5\text{deg}}\]
\[I_C := 4500A \cdot e^{j \cdot 94.16\text{deg}}\]

3. Determine the phase voltage given the following phase "a" referenced symmetrical components. Repeat assuming they are instead phase "b" and then phase "c" referenced symmetrical components

\[pu := 1\]
\[V_0 := 0.274pu \cdot e^{-j \cdot 90\text{deg}}\]
\[V_1 := 0.709pu \cdot e^{j \cdot 90\text{deg}}\]
\[V_2 := 0.299pu \cdot e^{-j \cdot 90\text{deg}}\]

4. Problem 2.10 in the textbook

5. Problem 2.13 in the textbook
6. Do the following (modified version of problem 2.12)

(a) A set of current transformers reads the following currents (in Amperes). If the current transformers each have a turns ratio of 5:500 (usually referred to as a current transformation ratio or CTR of 500:5) calculate the primary currents in amps.

(b) Calculate the symmetrical components of the secondary currents (I_{a0}, I_{a1}, I_{a2}).

(c) Calculate the current measured by the fourth ammeter (I_r) and compare it to the zero sequence current calculated in part (b). How do they compare?

(d) Using the primary current calculated in part (a), repeat part (b) if the CTs are connected in delta.