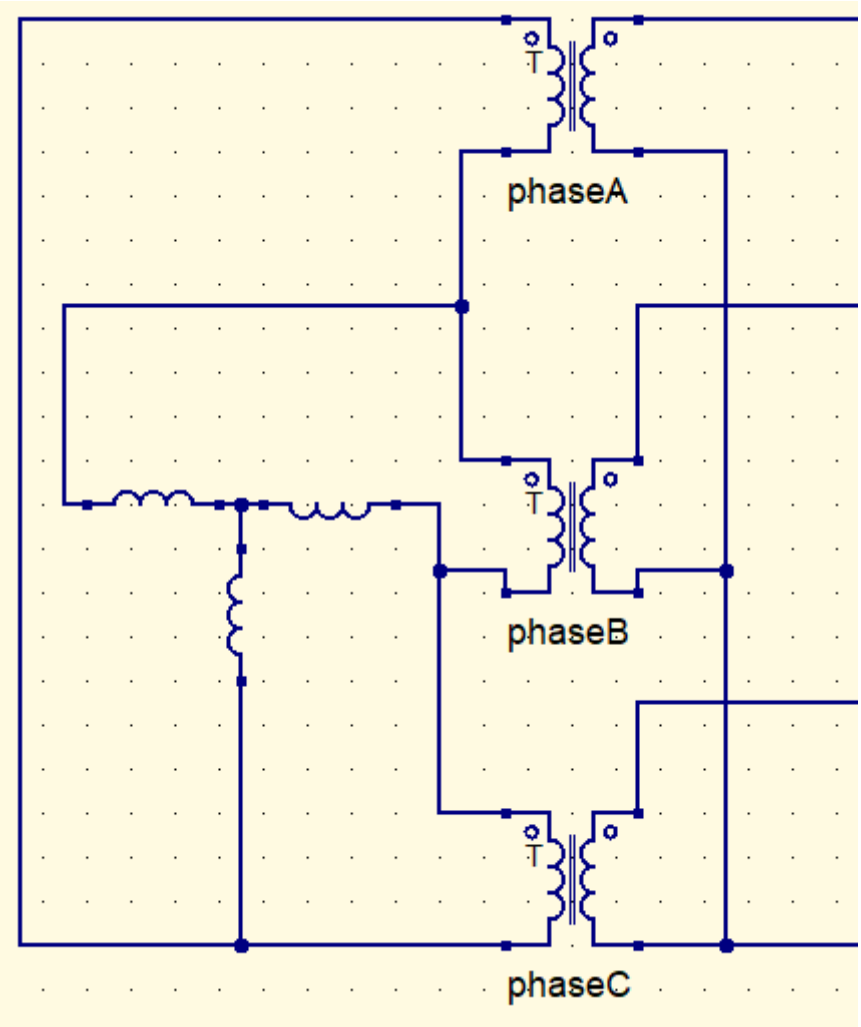
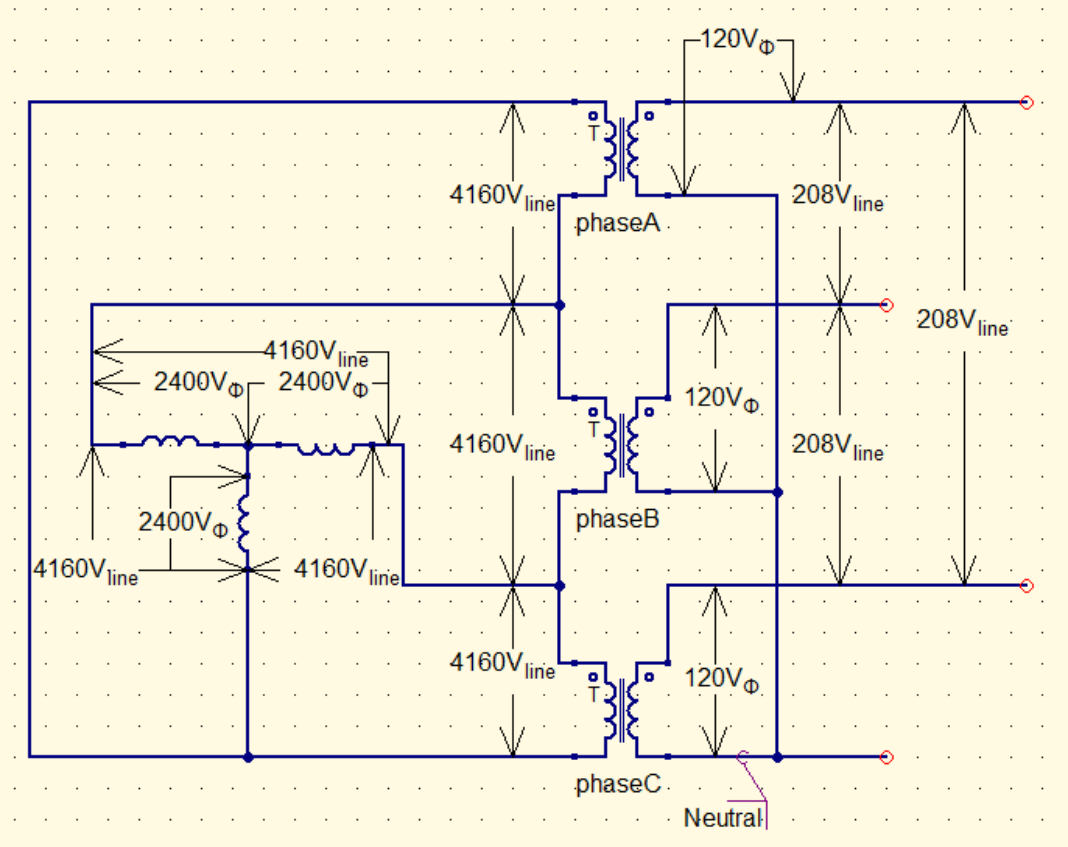
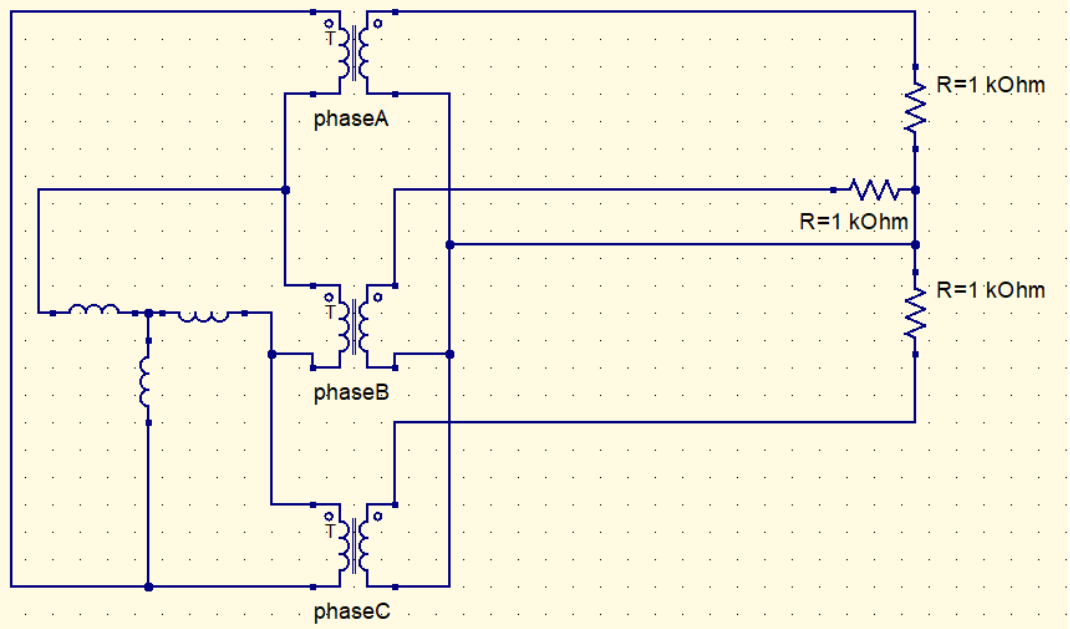
1. Draw the circuit of a 3-phase 4160/2400V generator.
   Note that the generator is in a WYE configured generator. Ignore any generator impedance. Draw this first before moving on.
   Connect the generator to the primary of a 3-phase transformer. You will only have 3 lines from the generator to the transformer primary. The transformer is rated at 1000kVA, 4160-208/120V, 60Hz. In this step, there is no load on the transformer, the secondary of the transformer is open-circuited.



2. Clearly label and determine of the following:
    1. $Vgenerator_{\phi}$
    2. $Vgenerator_{line}$
    3. $Vprimary_{\phi}$
    4. $Vprimary_{line}$
    5. $Vsecondary_{\phi}$
    6. $Vsecondary_{line}$



3. Connect a $1k\Omega$ resistor across each phase of the secondary of the transformer to neutral. Redraw the circuit.



4.

1. Determine V_{load} across each resistor. Show this voltage in the circuit diagram.

$$V_\phi = 120V = V_a \rightarrow V_{neutral} = V_b \rightarrow V_{neutral} = V_c \rightarrow V_{neutral} \quad (1)$$
$$\therefore$$
$$V_{load} = 120V$$

2. Find I_{load} through each resistor.

$$I_{load} = \frac{V_{load}}{R} = \frac{120V}{1k\Omega} = 120mA \tag{2}$$

3. Determine the current for each line from each of the secondary of the transformer to the load $I_{secondary_{line}}$.

$$\begin{aligned} I_{load} &= I_{secondary_{line}} \\ &\therefore \\ I_{secondary_{line}} &= 120mA \end{aligned} \tag{3}$$

4. Determine $I_{secondary_{\phi}}$.

$$\begin{aligned} &WYE\ config \\ &\therefore \\ I_{secondary_{\phi}} &= 120mA \end{aligned} \tag{4}$$

5. Determine $I_{primary_{\phi}}$.

$$\begin{aligned} I_{primary_{\phi}} &= \frac{I_{secondary_{\phi}}}{a};\ a = 34.\overline{6} \\ I_{primary_{\phi}} &= \frac{120mA}{34.\overline{6}} \approx 3.5mA \end{aligned} \tag{5}$$

6. Determine $I_{primary_{line}}$.

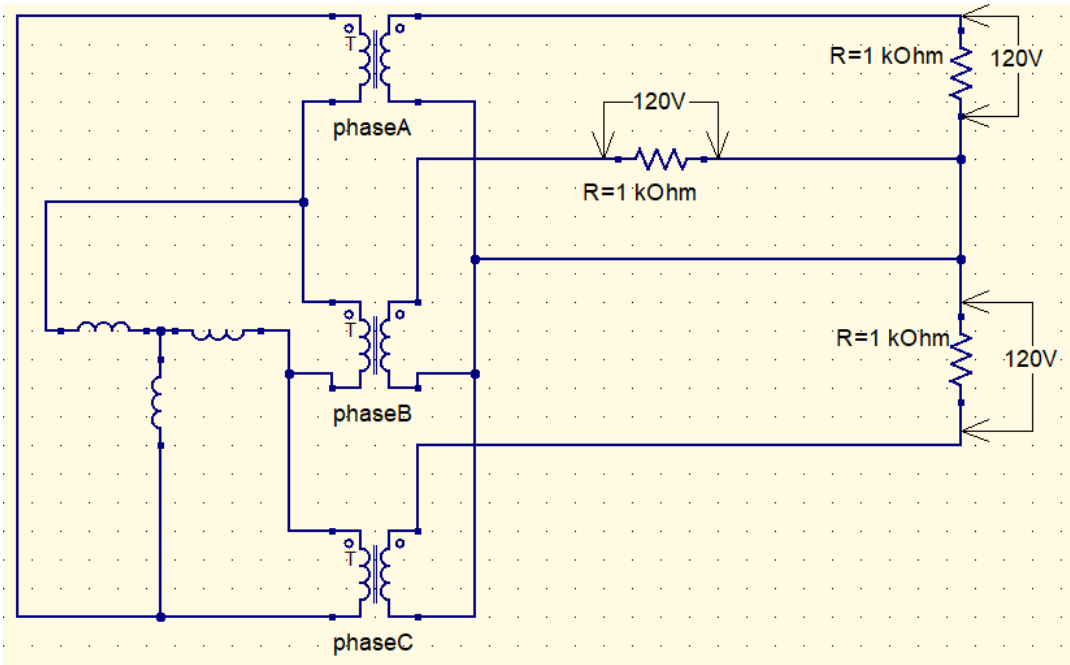
$$\begin{aligned} I_{primary_{line}} &= I_{primary_{\phi}} * \sqrt{3} \\ I_{primary_{line}} &= 5.996mA \approx 6mA \end{aligned} \tag{6}$$

7. Determine $I_{generator_{line}}$.

$$\begin{aligned} I_{generator_{line}} &= I_{primary_{line}} \\ &\therefore \\ I_{generator_{line}} &\approx 6mA \end{aligned} \tag{7}$$

8. Determine $I_{generator_{\phi}}$.

$$
\begin{aligned}
I_{generator_\phi} &= I_{primary_\phi} \\
&\therefore \\
I_{generator_\phi} &\approx 3.5mA
\end{aligned} \tag{8}
$$



5. From the numbers above, determine:

    1. $P_{generator_\phi}$

$$
\begin{aligned}
P_\phi &= I_\phi V_\phi \\
P_{generator_\phi} &= 3.5mA * 4160V \\
P_{generator_\phi} &= 14.4W
\end{aligned} \tag{9}
$$

    2. $P_{generator_{3\phi}}$

$$
\begin{aligned}
P_{3\phi} &= 3P_\phi \\
P_{generator_{3\phi}} &= 14.4W * 3 \\
P_{generator_{3\phi}} &\approx 43W
\end{aligned} \tag{10}
$$

    3. $P_{primary_\phi}$

$$
\begin{aligned}
P_\phi &= I_\phi V_\phi \\
P_{primary_\phi} &= 3.5mA * 4160V \\
P_{primary_\phi} &= 14.4W
\end{aligned} \tag{11}
$$

4. $P_{primary_{3\phi}}$

$$\begin{aligned} P_{3\phi} &= 3P_{\phi} \\ P_{primary_{3\phi}} &= 14.4W * 3 \\ P_{primary_{3\phi}} &\approx 43W \end{aligned} \tag{12}$$

5. $P_{secondary_{\phi}}$

$$\begin{aligned} P_{\phi} &= I_{\phi}V_{\phi} \\ P_{secondary_{\phi}} &= 120mA * 120V \\ P_{secondary_{\phi}} &= 14.4W \end{aligned} \tag{13}$$

6. $P_{secondary_{3\phi}}$

$$\begin{aligned} P_{3\phi} &= 3P_{\phi} \\ P_{secondary_{3\phi}} &= 14.4W * 3 \\ P_{secondary_{3\phi}} &\approx 43W \end{aligned} \tag{14}$$

7. $P_{load_{\phi}}$

$$\begin{aligned} P_{\phi} &= I_{\phi}V_{\phi} \\ P_{load_{\phi}} &= 120mA * 120V \\ P_{load_{\phi}} &= 14.4W \end{aligned} \tag{15}$$

8. $P_{load_{3\phi}}$

$$\begin{aligned} P_{3\phi} &= 3P_{\phi} \\ P_{secondary_{3\phi}} &= 14.4W * 3 \\ P_{secondary_{3\phi}} &\approx 43W \end{aligned} \tag{17}$$