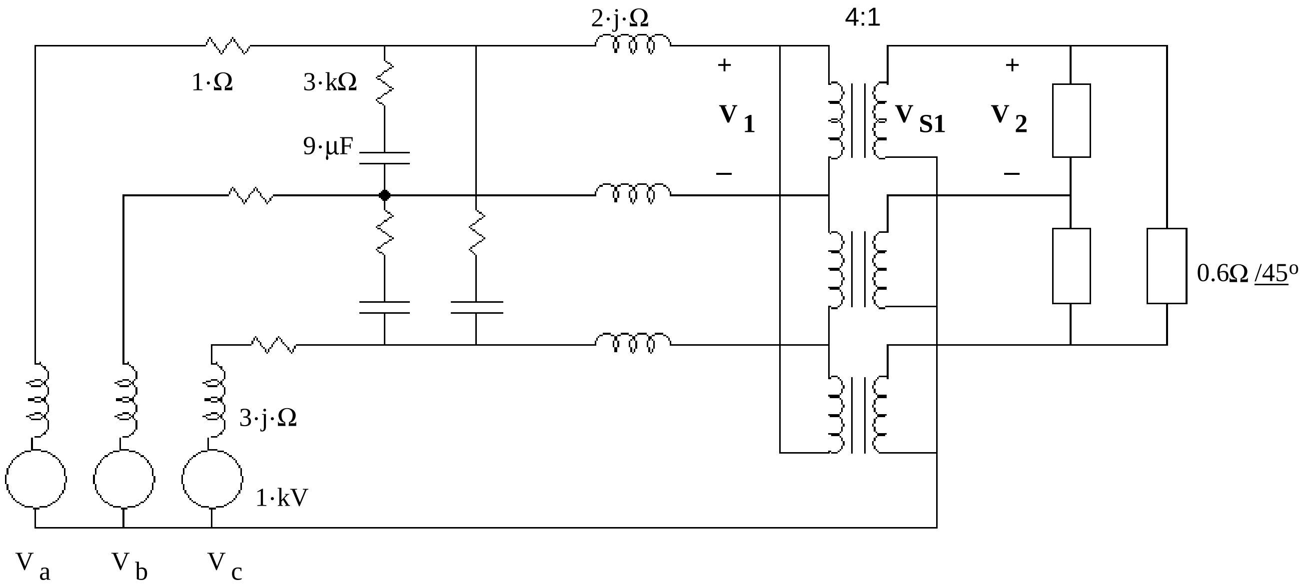
ECE 3600 homework 9B Due: Wed 2/15/23 Name________________________________

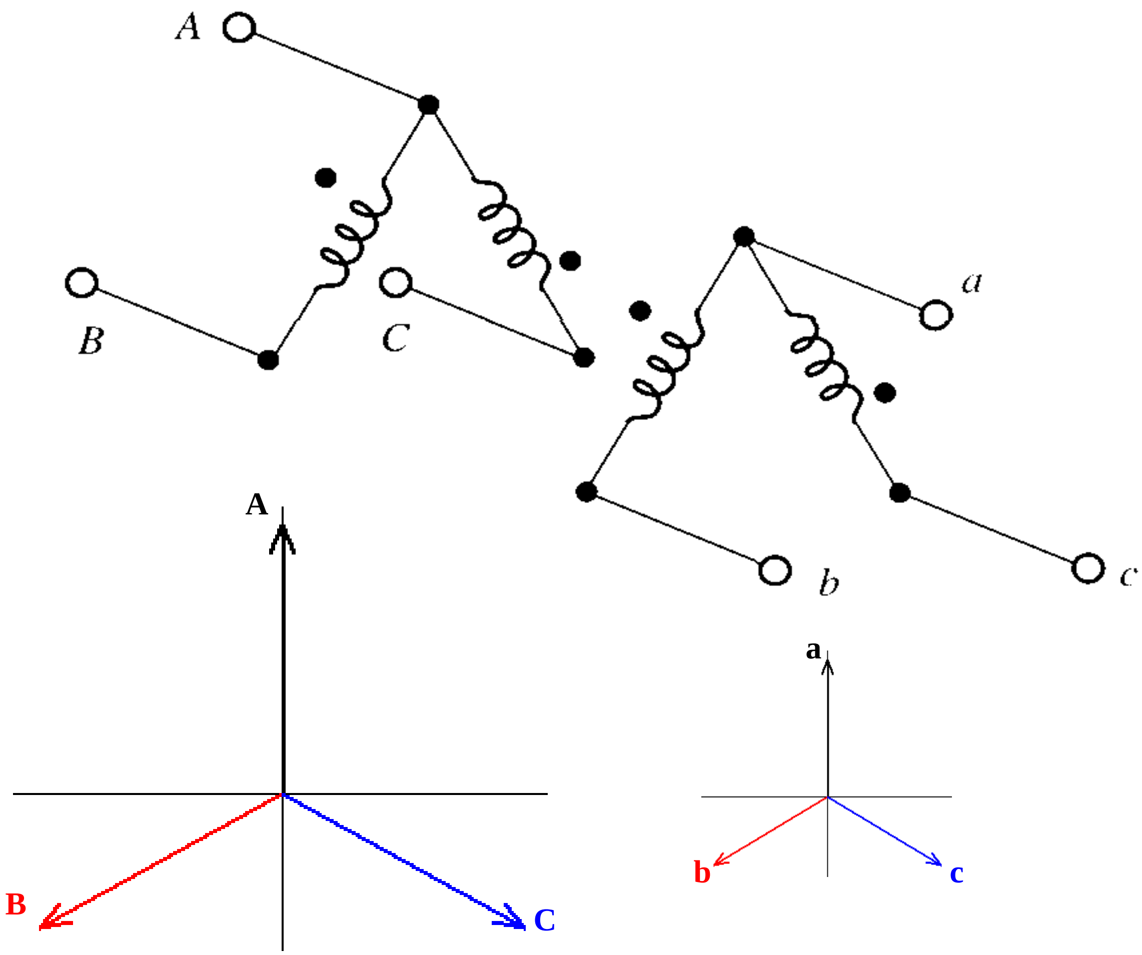
4. a) Draw a per-phase drawing of for the balanced 3-phase, 60-Hz system shown. You may neglect phase issues introduced by Y-Δ and Δ-Y connections. You may need to modify the turns ratio of the transformer to reflect Y-Δ and Δ-Y connections. Be sure to show values of the source, passive components and turns ratio on your drawing. b



b) Find $\frac{V_1}{V_2}$ incuding phase angle Modify turns ratio to reflect Δ-Y transformer connection

5. The configuration shown is called the “open-delta” or "V" connection, for obvious reasons. Identical 2:1 transformers are used.

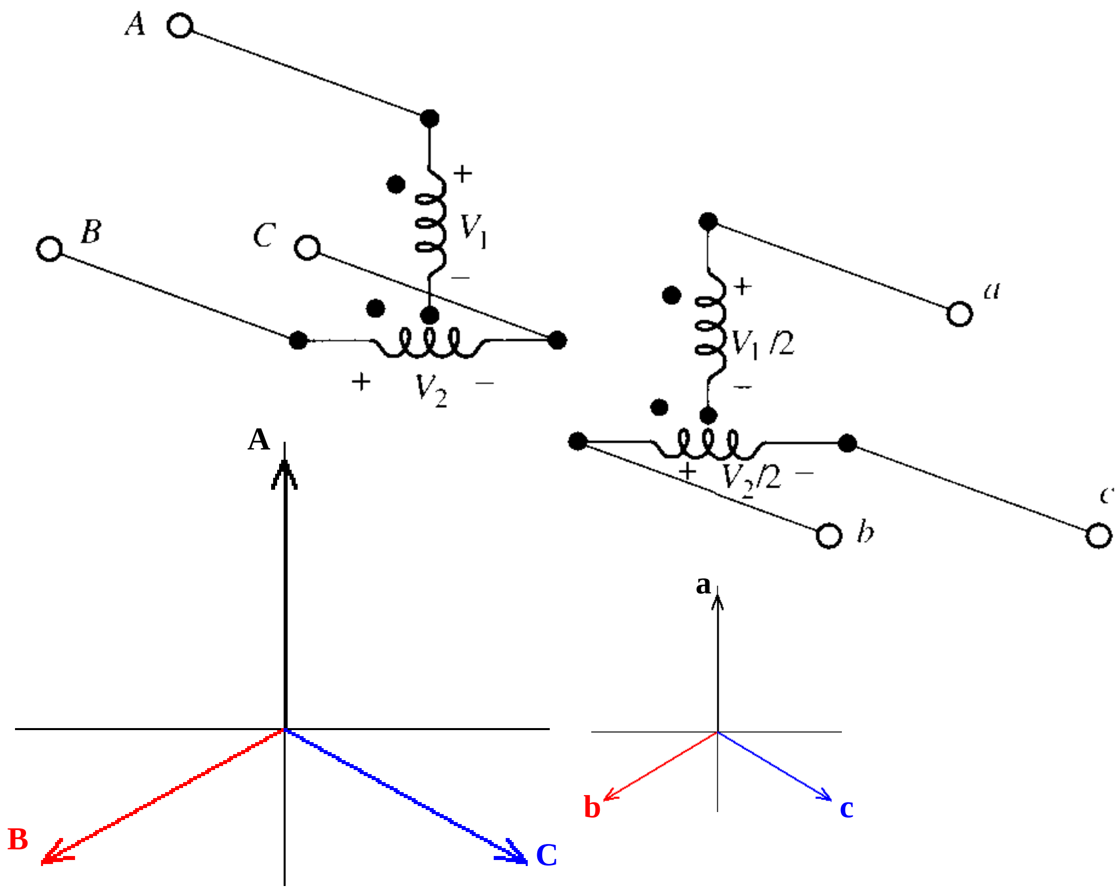
   a) Show that if ABC is 480-V balanced three phase, abc is 240-V balanced three-phase. Consider the ABC voltages to be a three-phase set and prove the abc set is three-phase.



b) If the load is 30 kVA, find the required kVA rating of the transformers to avoid overload.
   [You can solve this independent of part a)]

6. The configuration shown is called the "T" connection. For this connection, the 2:1 transformers are not identical but have different voltage and kVA ratings. The bottom transformer is center-tapped so as to have equal, in-phase voltages for each half.

b) If the load is 30 kVA, find the required kVA rating of each transformer to avoid overload.



7. A phase-shifting transformer has a complex turns ratio of $\mathbf{t} := 4 \cdot e^{j \cdot 20 \cdot deg}$ $= 4\ \underline{/20^o}$

It has a series impedance of $\mathbf{Z_S} := (0.05 + j \cdot 0.6) \cdot \Omega$ $\quad \mathbf{Y_S} := \frac{1}{\mathbf{Z_S}} =$

Find the admittance matrix of this tranformer
(see the last page of the transformer notes).

$$\begin{bmatrix} \mathbf{Y_S} & -\frac{\mathbf{Y_S}}{\mathbf{t}} \\ -\frac{\mathbf{Y_S}}{\overline{\mathbf{t}}} & \frac{\mathbf{Y_S}}{(|\mathbf{t}|)^2} \end{bmatrix} = \begin{bmatrix} \quad \end{bmatrix} \frac{1}{\Omega}$$