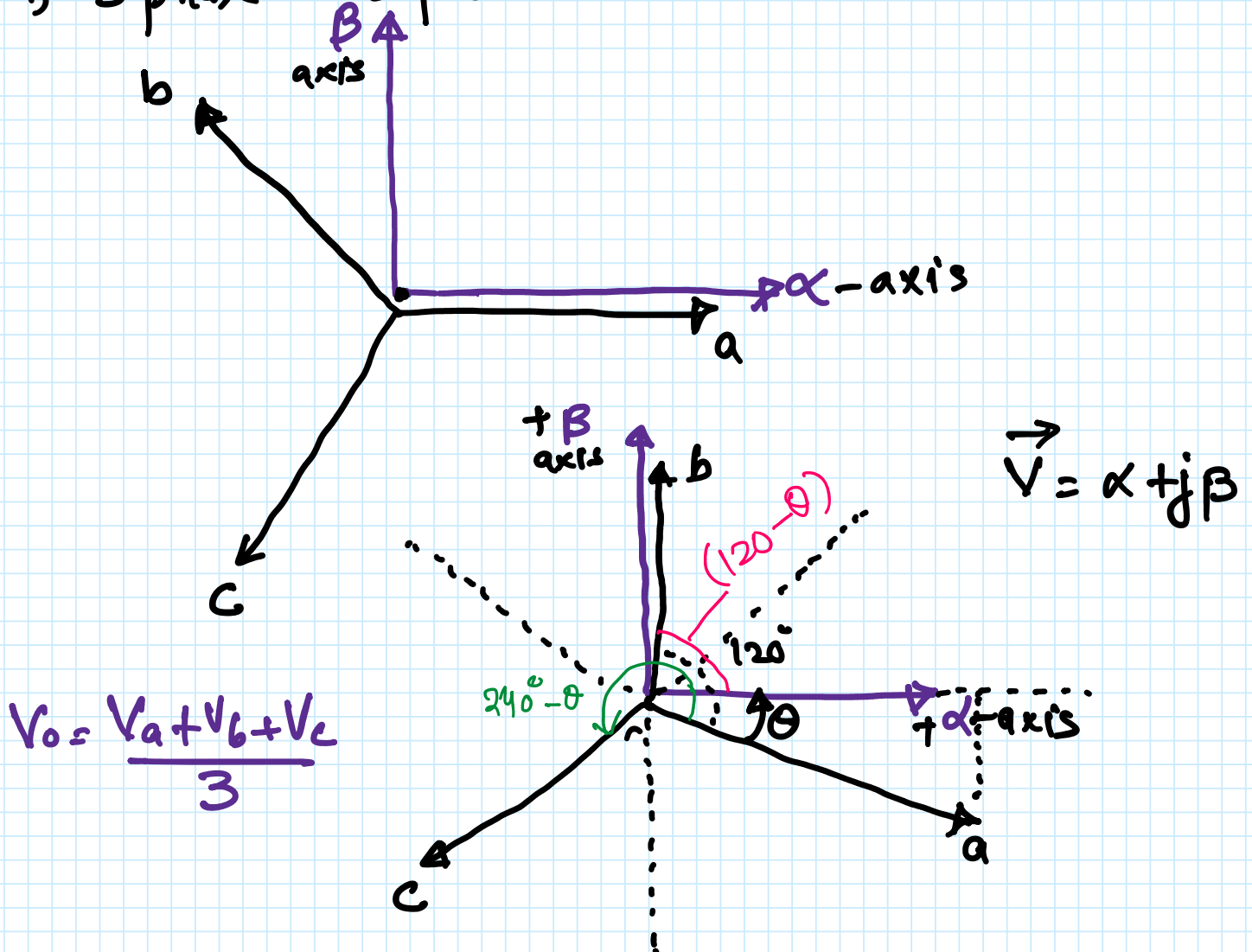


Transformations

Tuesday, October 22, 2019 5:40 PM

i) 3 phase \rightarrow 2 phase \rightarrow DC



$$\alpha = a \cos \theta + b \cos (120^\circ - \theta) + c \cos (240^\circ - \theta)$$

$$\beta = a \sin \theta + b \sin (120^\circ - \theta) + c \sin (240^\circ - \theta)$$

$$0 = \frac{a}{3} + \frac{b}{3} + \frac{c}{3}$$

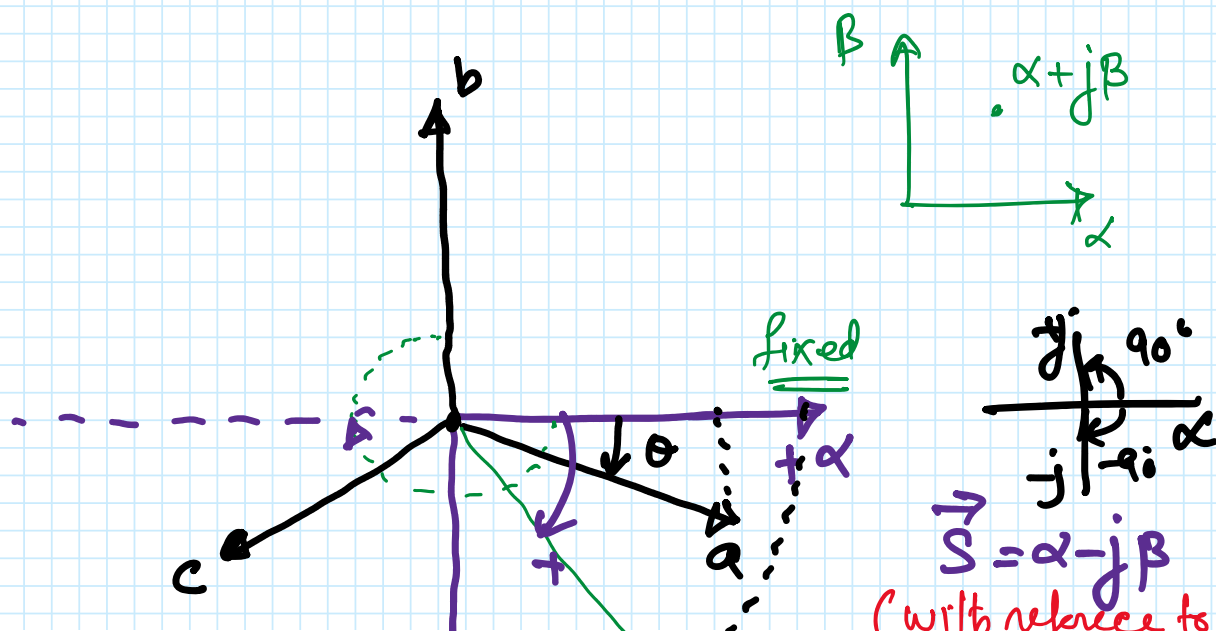
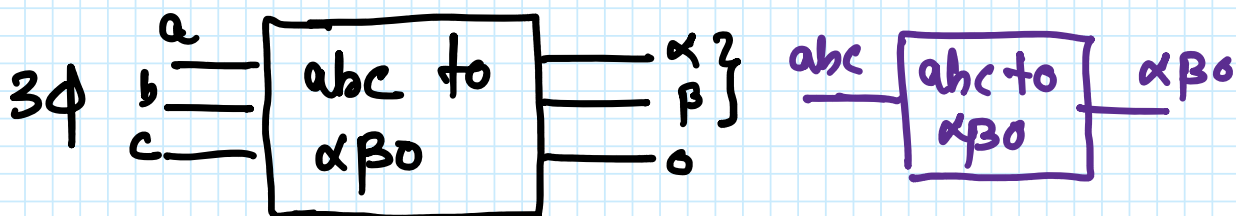
$$\begin{bmatrix} \alpha \\ \beta \\ 0 \end{bmatrix} = k \begin{bmatrix} \cos \theta & \cos (120^\circ - \theta) & \cos (240^\circ - \theta) \\ \sin \theta & \sin (120^\circ - \theta) & \sin (240^\circ - \theta) \\ 1/2 & 1/2 & 1/2 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

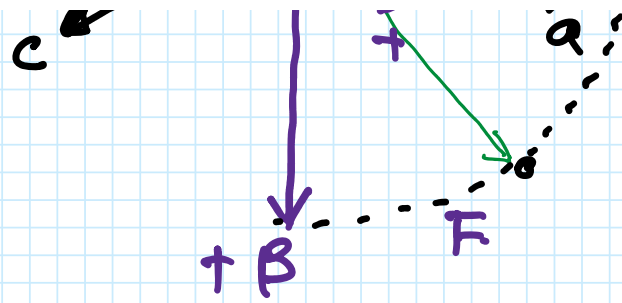
$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \underbrace{\begin{bmatrix} 1/2 & 1/2 & 1/2 \end{bmatrix}}_{K=2/3} \begin{bmatrix} a \\ b \\ c \end{bmatrix} \quad [Tabc]$$

$$\begin{bmatrix} \alpha \\ \beta \\ 0 \end{bmatrix} = \frac{2}{3} \begin{bmatrix} 1 & -1/2 & -1/2 \\ 0 & \sqrt{3}/2 & -\sqrt{3}/2 \\ 1/2 & 1/2 & 1/2 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$\begin{bmatrix} \alpha \\ \beta \\ 0 \end{bmatrix} = \underbrace{\begin{bmatrix} 2/3 & -1/3 & -1/3 \\ 0 & 1/\sqrt{3} & -1/\sqrt{3} \\ 1/3 & 1/3 & 1/3 \end{bmatrix}}_{Tabc} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$Tabc |_{\theta=0} \Rightarrow \alpha\text{-axis is aligned with phase a}$





$S = \alpha - j\beta$
 (with reference to previous discussion)
 $j = \angle 90^\circ$
 $-j = \angle -90^\circ$

$$\alpha = a \cos \theta + b \cos(\theta + 240^\circ) + c \cos(\theta + 120^\circ)$$

$$\beta = a \sin \theta + b \sin(\theta + 240^\circ) + c \sin(\theta + 120^\circ)$$

$$\begin{bmatrix} \alpha \\ \beta \\ 0 \end{bmatrix} = \frac{2}{3} \begin{bmatrix} 1 & -1/2 & -1/2 \\ 0 & -\frac{\sqrt{3}}{2} & \frac{\sqrt{3}}{2} \\ 1/2 & 1/2 & 1/2 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$[Tabc]$

$$[\alpha \beta 0] = [Tabc] [abc]$$

$$[abc] = [Tabc]^T [\alpha \beta 0]$$

