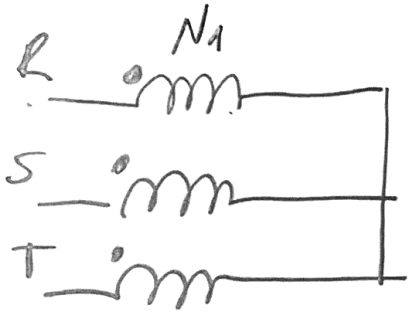
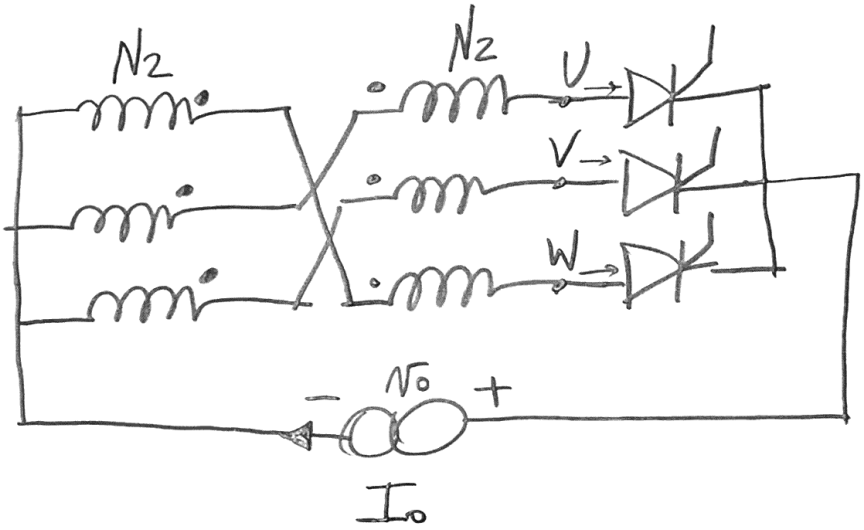
Examen de Electrónica de Potencia - Diciembre 2023

Solución Problema 1



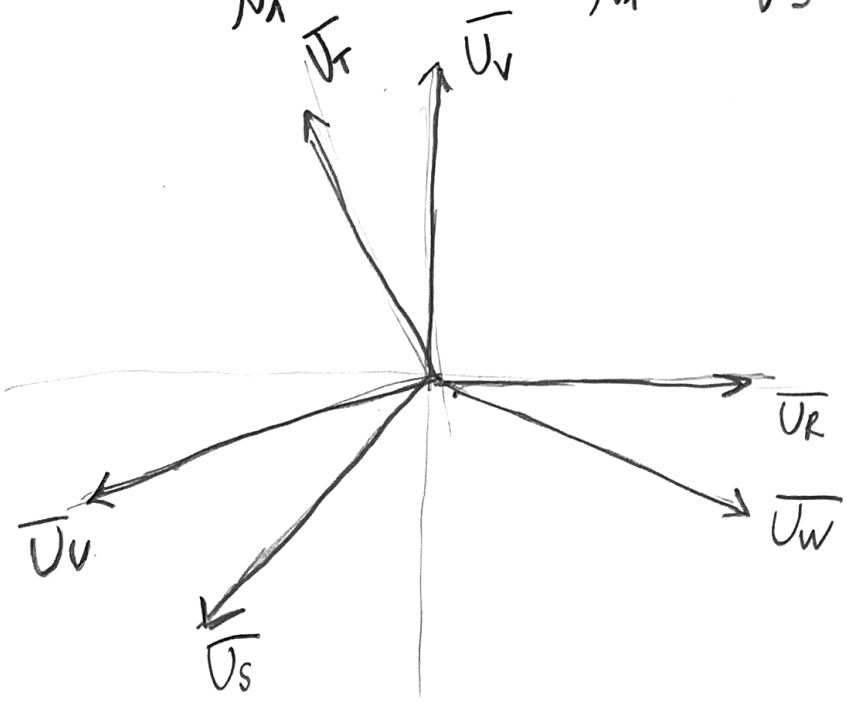


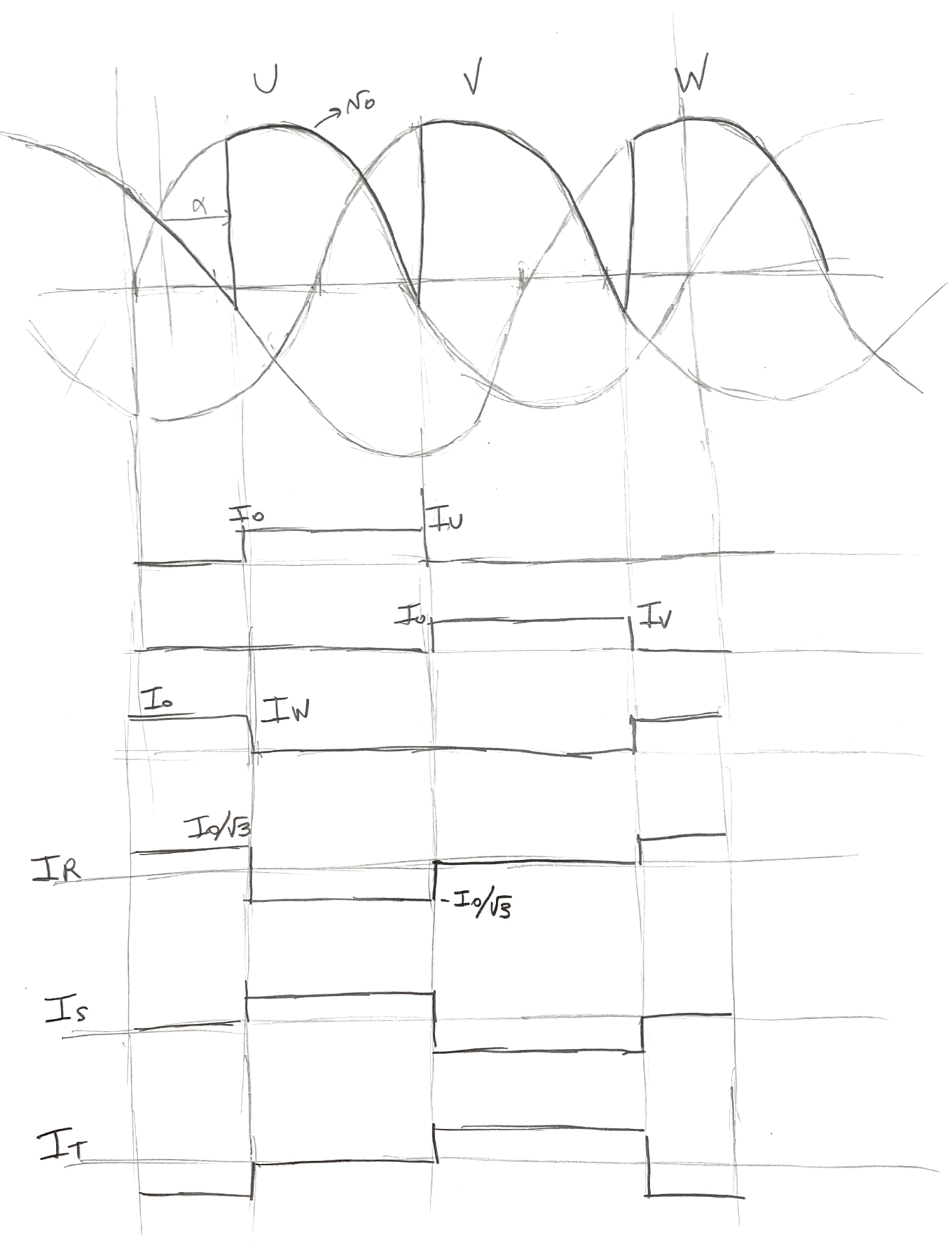
1) $\overline{U_U} = \overline{U_S}\frac{N_2}{N_1} - \overline{U_R}\frac{N_2}{N_1} = \frac{N_2}{N_1}(\overline{U_S} - \overline{U_R})$

Valor eficaz de U_U = Valor eficaz de $U_R = U$

$$U_U = \frac{N_2}{N_1}|\overline{U_S} - \overline{U_R}| = \frac{N_2}{N_1}U = \frac{U}{\sqrt{3}} \Rightarrow \frac{N_1}{N_2} = \sqrt{3}$$

2)




U
V
W
$\sqrt{2}$
α
I_0
I_U
I_0
I_V
I_0
I_W
$I_0/\sqrt{3}$
I_R
$-I_0/\sqrt{3}$
I_S
I_T

$I_0 = 84A$
$P_0 = 10KW$
$U = 230V$

$$\longrightarrow \langle v_0 \rangle = \frac{P_0}{I_0} = 119V$$

$$\langle v_0 \rangle = \frac{3}{\pi} \frac{\sqrt{2}\,V}{2} \cos\alpha$$

$$\Rightarrow \alpha = 40°$$

$$I_R N_1 = I_W N_2 - I_U N_2 \Rightarrow I_R = \frac{N_2}{N_1} (I_W - I_U)$$

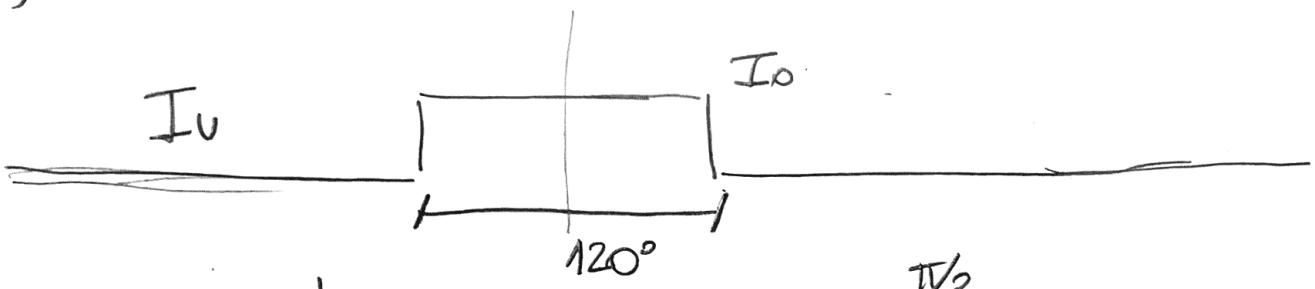
$$I_S N_1 = I_U N_2 - I_V N_2 \Rightarrow I_S = \frac{N_2}{N_1} (I_U - I_V)$$

$$I_T N_1 = I_V N_2 - I_W N_2 \Rightarrow I_T = \frac{N_2}{N_1} (I_V - I_W)$$

5) $$I_R(n) = \frac{N_2}{N_1} (I_W(n) - I_U(n)) = \frac{N_2}{N_1} \left(I_U(n) e^{j\frac{2\pi}{3}n} - I_U(n) \right)$$

$$I_R(n) = I_U(n) \left(e^{j\frac{2\pi n}{3}} - 1 \right)$$

6) Opción 1



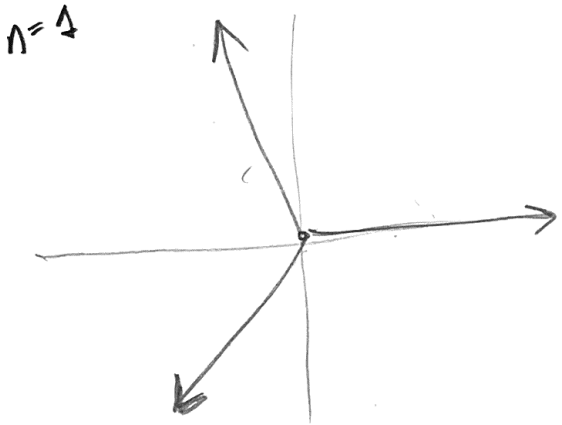
$$I_U(n) = \frac{2}{T}\int_{-t_{bo}}^{t_{bo}} I_o \cos(2\pi f n t)\,dt = \frac{1}{\pi}\int_{-\pi/3}^{\pi/3} I_o \cos(n\theta)\,d\theta$$

$$= \frac{I_o}{n\pi}\left(\operatorname{sen}(n\pi/3) - \operatorname{sen}(-n\pi/3)\right) = \frac{I_o}{n\pi} 2\operatorname{sen}(n\pi/3)$$

Si $n = \dot{3} \Rightarrow I_U(n) = 0$

Opción 2

$$0 = I_R(n)\left[1 + e^{-j\frac{2\pi}{3}n} + e^{+j\frac{2\pi}{3}n}\right]$$



$= 0 \quad \forall n \neq \dot{3}$

$= 3 \quad \forall n = \dot{3}$

Entonces:

$n \neq \dot{3} \quad 0 = 0$

$n = \dot{3} \quad 0 = I_R(n) \cdot 3$

$\Rightarrow I_R(n) = 0$