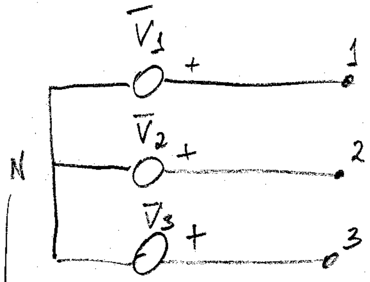
Circuitos Trifasicos.

Fuente.

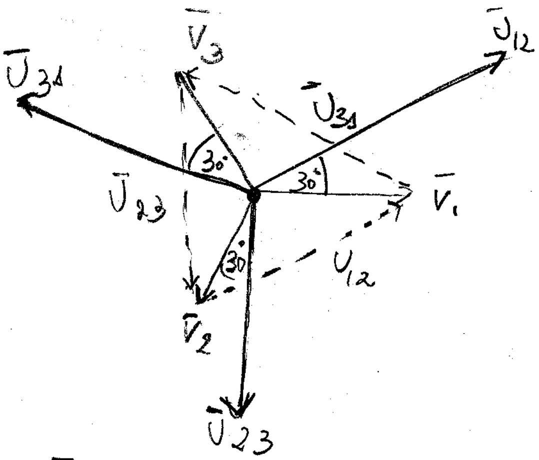


$$\left\{\begin{array}{l} \bar{V}_1 = V \angle 0^\circ \\ \bar{V}_2 = V \angle -120^\circ \\ \bar{V}_3 = V \angle 120^\circ \end{array}\right\} \text{Fuente Trifasica perfecta.}$$

→ Neutro de la fuente.

→ tensiones fase Neutro ⇒ tensiones de fase

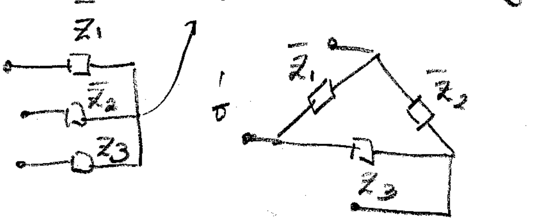
$$\left.\begin{array}{l} \bar{U}_{12} = \bar{V}_1 - \bar{V}_2 \\ \bar{U}_{23} = \bar{V}_2 - \bar{V}_3 \\ \bar{U}_{31} = \bar{V}_3 - \bar{V}_1 \end{array}\right\} \text{Tensiones de linea ó compuestas.}$$



$$|\bar{U}_{12}| = |\bar{U}_{23}| = |\bar{U}_{31}| = \sqrt{3}\, V$$

Cargas:

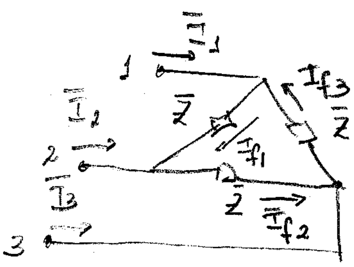
Neutro de la carga.



Si ademas $\bar{Z}_1 = \bar{Z}_2 = \bar{Z}_3 = \bar{Z}$

⇒ Cargas Equilibradas.

Corrientes de linea y de fase



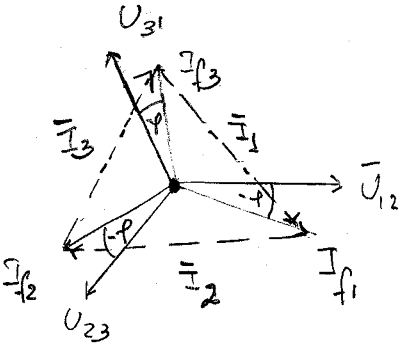
$\bar{I}_1, \bar{I}_2, \bar{I}_3$ - Corrientes de linea.

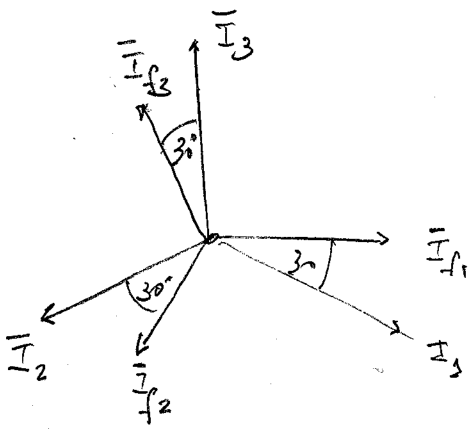
$\bar{I}_{f1}, \bar{I}_{f2}, \bar{I}_{f3}$ - Corrientes de fase.

$$\left\{\begin{array}{l} \bar{I}_1 = \bar{I}_{f1} - \bar{I}_{f3} \\ \bar{I}_2 = \bar{I}_{f2} - \bar{I}_{f1} \\ \bar{I}_3 = \bar{I}_{f3} - \bar{I}_{f2} \end{array}\right.$$

- $\bar{Z} = Z\angle\varphi$
- tensión de línea: U

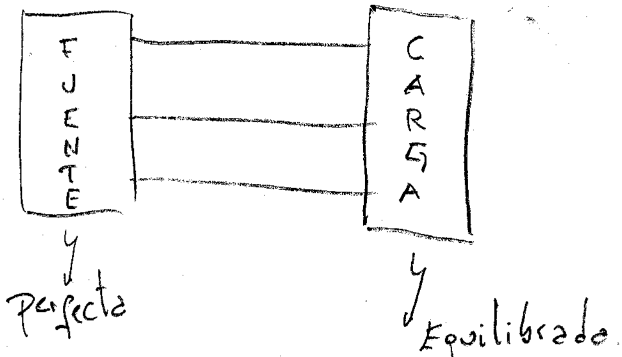
$$\begin{cases} \bar{I}_{f1} = \dfrac{\bar{U}_{12}}{Z\angle\varphi} = \dfrac{U}{Z}\angle{-\varphi} \\ \bar{I}_{f2} = \dfrac{\bar{U}_{23}}{Z\angle\varphi} = \dfrac{U}{Z}\angle{-120-\varphi} \\ \bar{I}_{f3} = \dfrac{\bar{U}_{31}}{Z\angle\varphi} = \dfrac{U}{Z}\angle{120-\varphi} \end{cases}$$



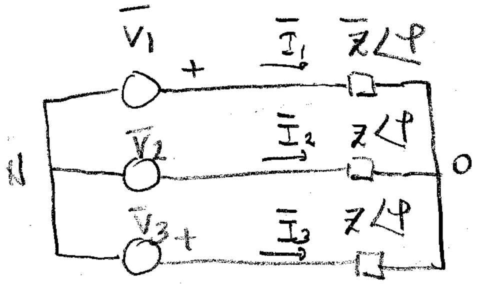


Entonces: $|\bar{I}_1| = |\bar{I}_2| = |\bar{I}_3| = \sqrt{3}\,\dfrac{U}{Z}$ con $|\bar{I}_{f1}| = |\bar{I}_{f2}| = |\bar{I}_{f3}| = \dfrac{U}{Z}$

Circuito Monofásico λ Equivalente.



- La fuente siempre se puede representar en λ
- La carga siempre se puede representar en λ.



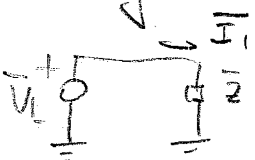
$$\begin{cases} \bar{V}_1 = V\angle 0° \\ \bar{V}_2 = V\angle{-120°} \\ \bar{V}_3 = V\angle{-120°} \end{cases}$$

$$\bar{V}_1 = \bar{Z}\bar{I}_1 + \bar{V}_{ON}$$
$$\bar{V}_2 = \bar{Z}\bar{I}_2 + \bar{V}_{ON}$$
$$\bar{V}_3 = \bar{Z}\bar{I}_3 + \bar{V}_{ON}$$

$$\underbrace{\bar{V}_1 + \bar{V}_2 + \bar{V}_3}_{=0 \text{ fuente perfecta}} = \bar{Z}\underbrace{(\bar{I}_1 + \bar{I}_2 + \bar{I}_3)}_{=0 \text{ Kirchoff}} + 3\bar{V}_{ON} \Rightarrow V_{ON} = 0 \Rightarrow \underline{\underline{\bar{V}_O = \bar{V}_N}}$$

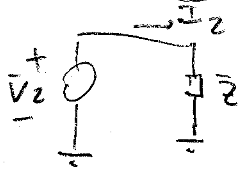
El neutro de la fuente está a la misma tensión que el neutro de la carga. #

$\Rightarrow \bar{I}_1 = \dfrac{\bar{V}_1}{\bar{Z}}$



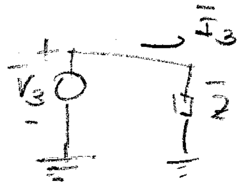
$\Rightarrow \bar{I}_1 = \dfrac{V}{Z}\angle{-\varphi}$

$$\bar{I}_2 = \frac{\bar{V}_2}{\bar{Z}}$$



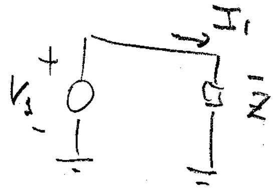
$$\Rightarrow \bar{I}_2 = \frac{V}{Z} \angle -120 - \varphi$$

$$\bar{I}_3 = \frac{\bar{V}_3}{\bar{Z}}$$



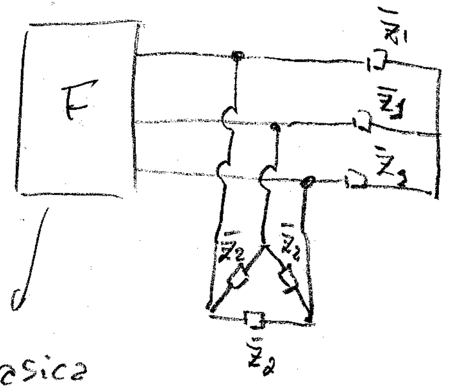
$$\Rightarrow \bar{I}_3 = \frac{V}{Z} \angle 120 - \varphi$$

observar:
- Las tres corrientes tienen el mismo modulo.
- La fase de $\bar{I}_2$ y $\bar{I}_3$ se puede obtener de $\bar{I}_1$ restando 120 y sumando 120° a la fase de esta ultima.
- Solo resuelvo:



Circuito Monofasico Equivalente

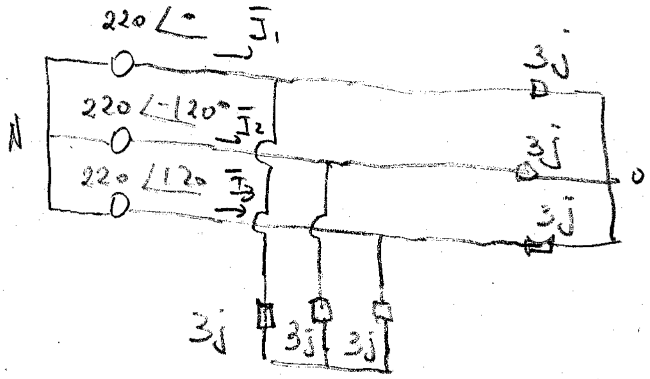
Ejemplo

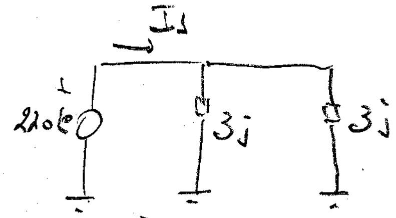


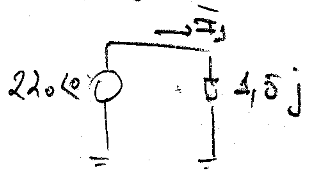
$$\bar{Z}_1 = 3j\ \Omega$$
$$\bar{Z}_2 = 9j\ \Omega$$

Determinar corriente entregada por la fuente

Trifasica perfecta tension de linea 380 V







$$\bar{I}_1 = \frac{220}{1{,}5\angle 90°} = 146{,}7\angle -90°$$

$$\Rightarrow \bar{I}_2 = 146{,}7 \angle -120 - 90 = 146{,}7 \angle -210°$$
$$\bar{I}_3 = 146{,}7 \angle 120 - 90° = 146{,}7 \angle 30°$$