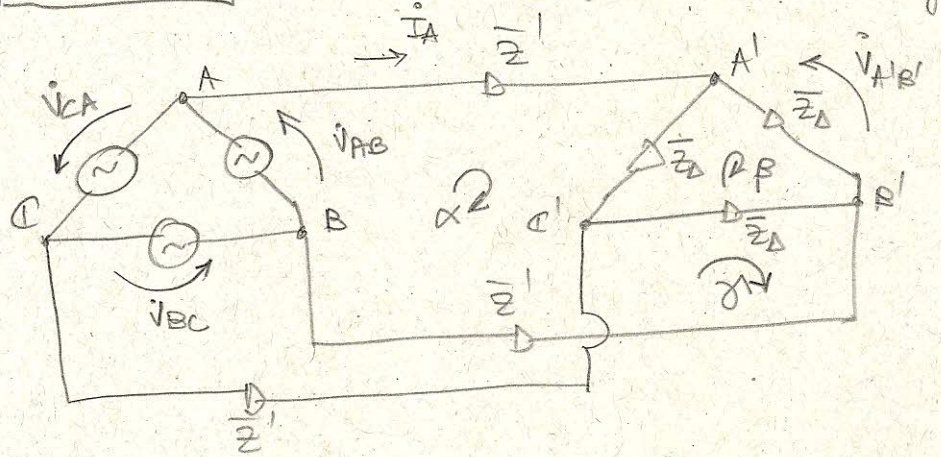
+33/5/44+

α: A–A'–C'–C–A
β: A'–B'–C'–A'
γ: C–C'–B'–B–C

EXEMPLO



- Gerador: 220 V (linha)
- Carga: $\bar{Z}_\Delta = (3+j4)\,\Omega$
- Linha: $\bar{Z}' = (0{,}2+j0{,}15)\,\Omega$

→ SEQUÊNCIA INVERSA
→ $\dot{V}_{AB} = 220\angle 0°$ V

(A) RESOLUÇÃO POR ANÁLISE DE MALHAS

	α	β	γ
α	$\bar{Z}'+\bar{Z}_\Delta+\bar{Z}'$	$-\bar{Z}_\Delta$	$-\bar{Z}'$
β	$-\bar{Z}_\Delta$	$3\bar{Z}_\Delta$	$-\bar{Z}_\Delta$
γ	$-\bar{Z}'$	$-\bar{Z}_\Delta$	$\bar{Z}'+\bar{Z}_\Delta+\bar{Z}'$

$\cdot$ | α / β / γ | $=$ | $-\dot{V}_{CA}$ / 0 / $-\dot{V}_{BC}$

$3{,}4+j4{,}3$	$-3-j4$	$-0{,}2-j0{,}15$
$-3-j4$	$9+j12$	$-3-j4$
$-0{,}2-j0{,}15$	$-3-j4$	$3{,}4+j4{,}3$

$\cdot$ | α / β / γ | $=$ | $220\angle -120°+180°$ / 0 / $220\angle 120°-180°$

$\therefore$ | α / β / γ | $=$ | $66{,}572\angle -21{,}03°$ / $38{,}436\angle -51{,}03°$ / $66{,}572\angle -81{,}03°$ A

CORRENTES DE LINHA

$$\dot{I}_A = \alpha = 66{,}572 \angle -21{,}03^\circ \text{ A}$$

$$\dot{I}_B = -\gamma' = 66{,}572 \angle 98{,}97^\circ \text{ A}$$

$$\dot{I}_C = -\alpha + \gamma' = 66{,}572 \angle -141{,}03^\circ \text{ A}$$

CORRENTES DE FASE NA CARGA

$$\dot{I}_{A'B} = \beta = 38{,}436 \angle -51{,}03^\circ \text{ A}$$

$$\dot{I}_{B'C'} = \beta - \gamma' = 38{,}436 \angle 68{,}97^\circ \text{ A}$$

$$\dot{I}_{C'A'} = -\alpha + \beta = 38{,}436 \angle -171{,}03^\circ \text{ A}$$

TENSÕES NA CARGA

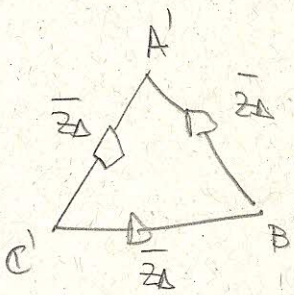
$$\dot{V}_{A'B'} = \bar{Z}_\Delta \cdot \dot{I}_{A'B'} = 192{,}18 \angle 2{,}10^\circ \text{ V}$$

$$\dot{V}_{B'C'} = \bar{Z}_\Delta \cdot \dot{I}_{B'C'} = 192{,}18 \angle 122{,}10^\circ \text{ V}$$

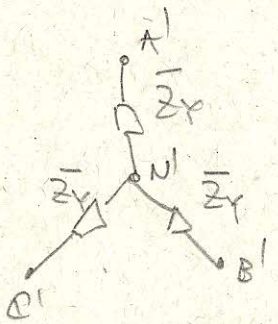
$$\dot{V}_{C'A'} = \bar{Z}_\Delta \cdot \dot{I}_{C'A'} = 192{,}18 \angle -117{,}90^\circ \text{ V}$$

+34/5/38+

(B) RESOLUÇÃO POR CARGA EQUIVALENTE EM Y

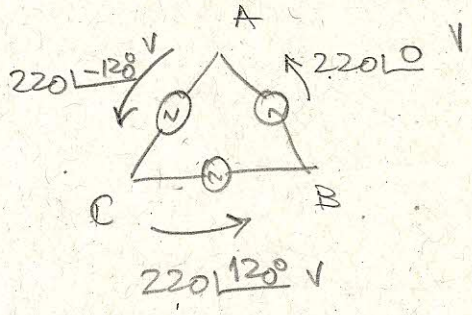


≡

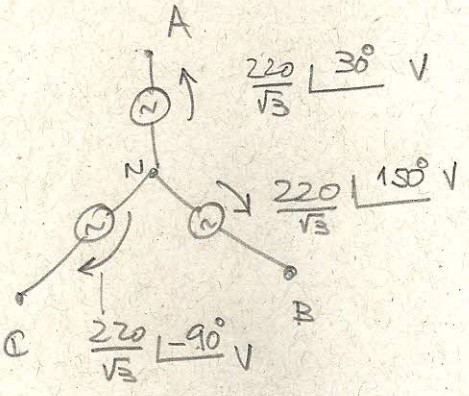


$$\bar{Z}_Y = \frac{\bar{Z}_\Delta}{3} = \frac{3+j4}{3}\ \Omega$$

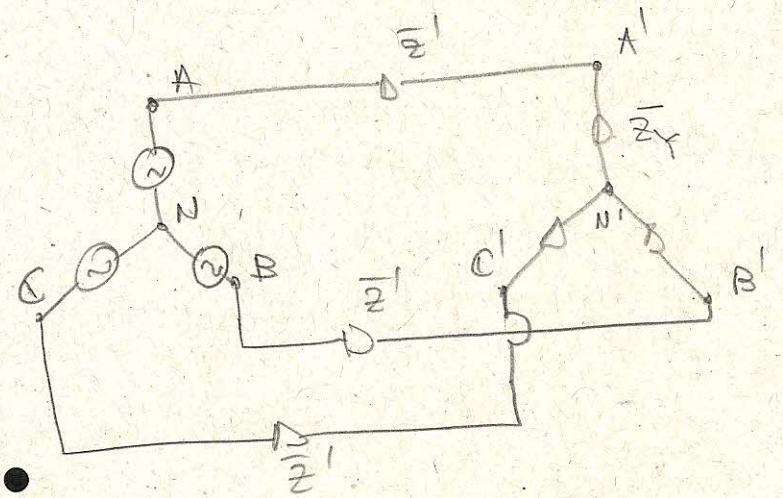
Gerador equivalente em Y:



≡

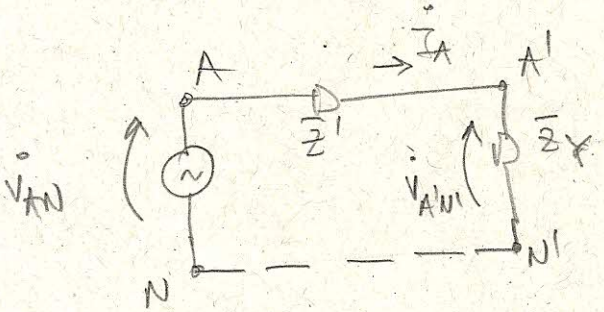


Circuito 3Φ equivalente em Y



+35/3/34+

Circuito 1Φ equivalente



$$\dot{V}_{AN} = \frac{220}{\sqrt{3}} \angle 30^\circ \text{ V}$$

$$\bar{Z}' = (0{,}2 + j0{,}15)\ \Omega$$

$$\bar{Z}_Y = \frac{3 + j4}{3}\ \Omega$$

$$\dot{I}_A = \frac{\dot{V}_{AN}}{\bar{Z}' + \bar{Z}_Y} = \frac{\frac{220}{\sqrt{3}} \angle 30^\circ}{(0{,}2 + j0{,}15) + \frac{3 + j4}{3}} = 66{,}572 \angle -21{,}03^\circ \text{ A}$$

$$\dot{V}_{A'N'} = \bar{Z}_Y \cdot \dot{I}_A = 110{,}954 \angle 32{,}10^\circ \text{ V}$$

CORRENTES DE LINHA

$$\dot{I}_A = 66{,}572 \angle -21{,}03^\circ \text{ A}$$

$$\dot{I}_B = \alpha \dot{I}_A = 66{,}572 \angle 98{,}97^\circ \text{ A}$$

$$\dot{I}_C = \alpha^2 \dot{I}_A = 66{,}572 \angle -141{,}03^\circ \text{ A}$$

→ SEQ. INVERSA

TENSÕES NA CARGA

$$\dot{V}_{A'B'} = \sqrt{3} \angle -30^\circ \dot{V}_{A'N'} = \sqrt{3} \angle -30^\circ \cdot 110{,}954 \angle 32{,}10^\circ$$

$$= 192{,}18 \angle 2{,}10^\circ \text{ V}$$

↑ LIG. Y e SEQ. INVERSA

$$\begin{cases} \dot{V}_{B'C'} = \sqrt{3}\ \angle -30^\circ\ \dot{V}_{B'N'} = 192{,}18\ \angle 122{,}10^\circ\ V \\ V_{C'A'} = \sqrt{3}\ \angle -30^\circ\ \dot{V}_{C'N'} = 192{,}18\ \angle -117{,}90^\circ\ V \end{cases}$$

CORRENTES DE ~~FASE~~ NA CARGA

$$\dot{I}_{A'B'} = \frac{\dot{I}_A}{\sqrt{3}\ \angle 30^\circ} = \frac{66{,}572\ \angle -21{,}03^\circ}{\sqrt{3}\ \angle 30^\circ} = 38{,}435\ \angle -51{,}03^\circ A$$

↑ LIG. Δ e SEQ. INVERSA

$$\dot{I}_{B'C'} = \frac{\dot{I}_B}{\sqrt{3}\angle 30^\circ} = 38{,}435\ \angle 68{,}97^\circ\ A$$

$$\dot{I}_{C'A'} = \frac{\dot{I}_C}{\sqrt{3}\ \angle 30^\circ} = 38{,}435\ \angle -171{,}03^\circ\ A$$

OUTRA FORMA PARA CALCULAR AS TENSÕES NA CARGA

$$\dot{V}_{A'B'} = \bar{Z}_\Delta \cdot \dot{I}_{A'B'} = (3+j4) \times 38{,}435\ \angle -51{,}03^\circ = 192{,}18\ \angle 2{,}10^\circ\ V$$

$$\begin{cases} \dot{V}_{B'C'} = \bar{Z}_\Delta \cdot \dot{I}_{B'C'} = 192{,}18\ \angle 122{,}10^\circ\ V \\ \dot{V}_{C'A'} = \bar{Z}_\Delta \cdot \dot{I}_{C'A'} = 192{,}18\ \angle -117{,}90^\circ\ V \end{cases}$$