

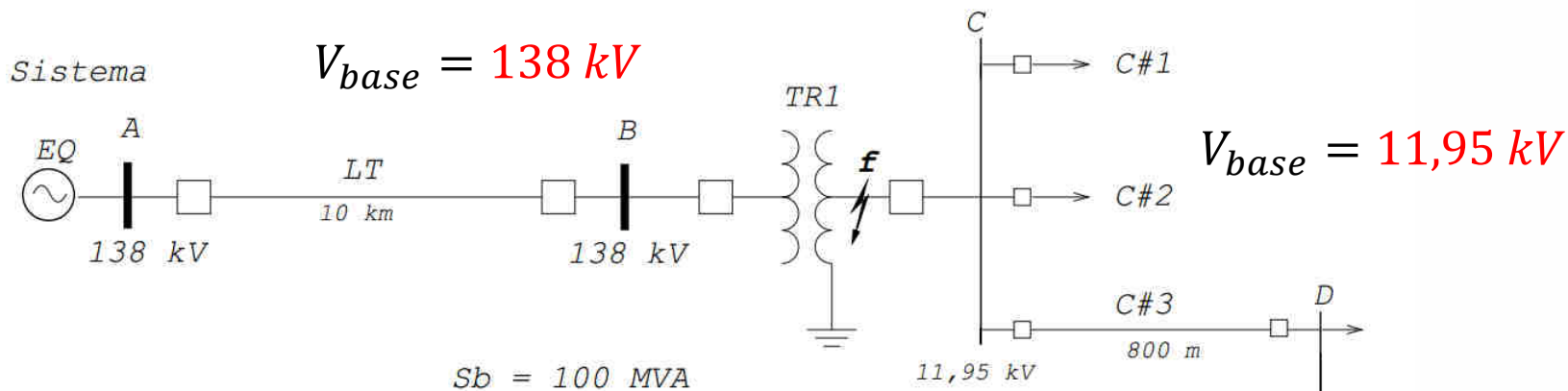
Sistemas Elétricos de Potência

Aula 06-P3 – Cálculos de Curto-circuito **Monofásico** em um Sistema com Co-gerador

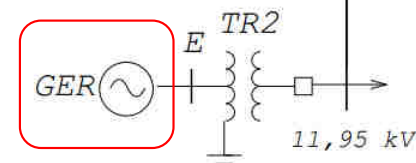


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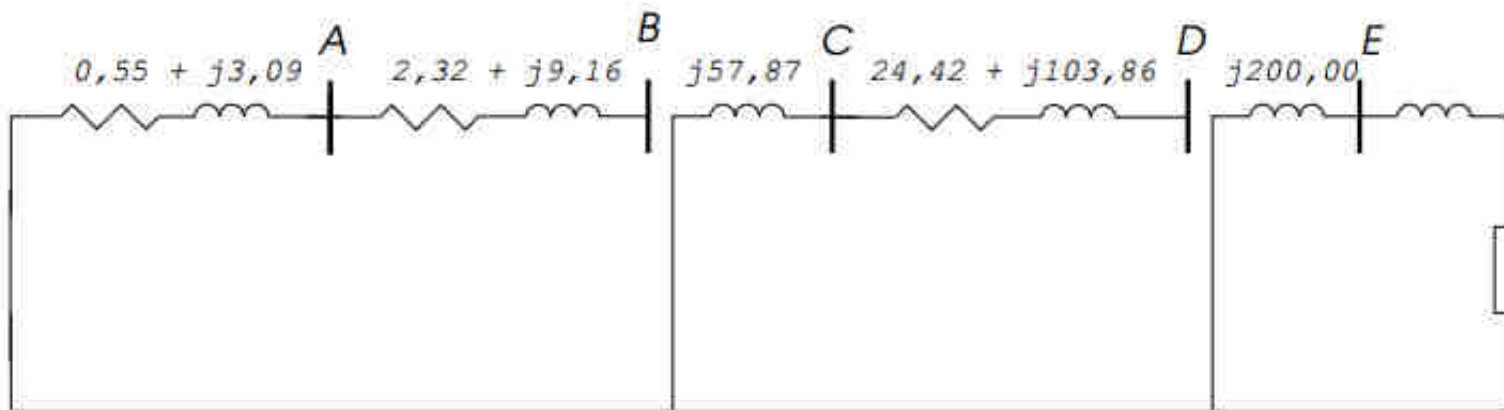
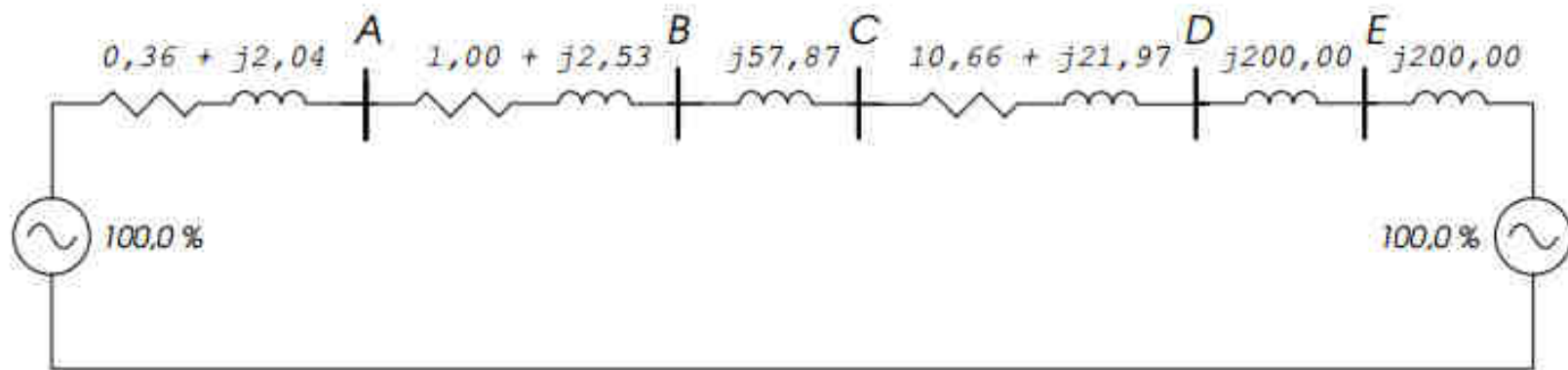
Sistema com Co-gerador



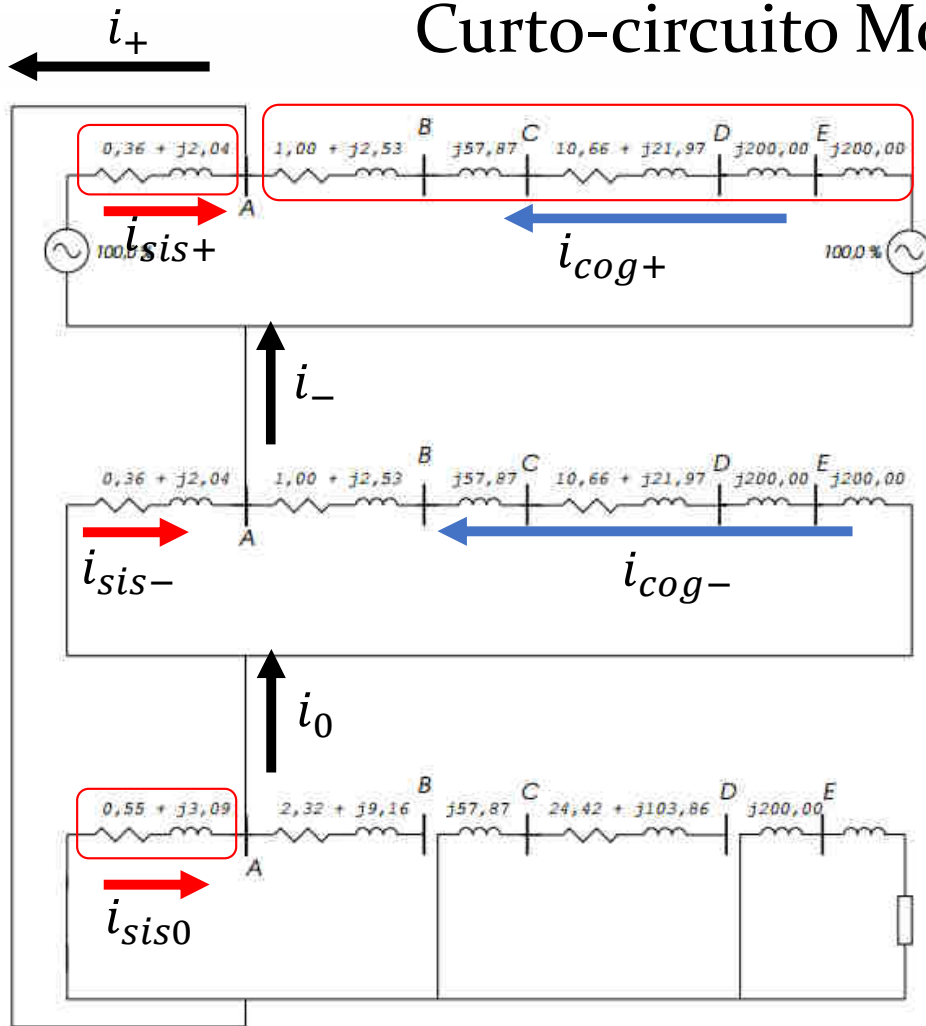
A	Curto-circuito trifásico = 4.808 MVA -80° Curto-circuito monofásico = 4.109 MVA -80°
LT	$z_+ = 0,1902 + j0,4808 \text{ ohm/km}$ $z_o = 0,4414 + j1,7452 \text{ ohm/km}$
TR1	138,0/11,95 kV - 15 MVA - j8,68 %
C#3	$z_+ = 0,1903 + j0,3922 \text{ ohm/km}$ $z_o = 0,4359 + j1,8540 \text{ ohm/km}$
TR2	11,95/11,95 kV - 2,5 MVA - j5,0 %
GER	11,95 kV - 10,0 MVA - $x_d' = j20,0 \%$



Preparação dos dados



Curto-circuito Monofásico – Barra A



$$z_{sis}^+ = 2,07 \angle 79,99^\circ \%$$

$$z_{cog}^+ = 482,51 \angle 88,62^\circ \%$$

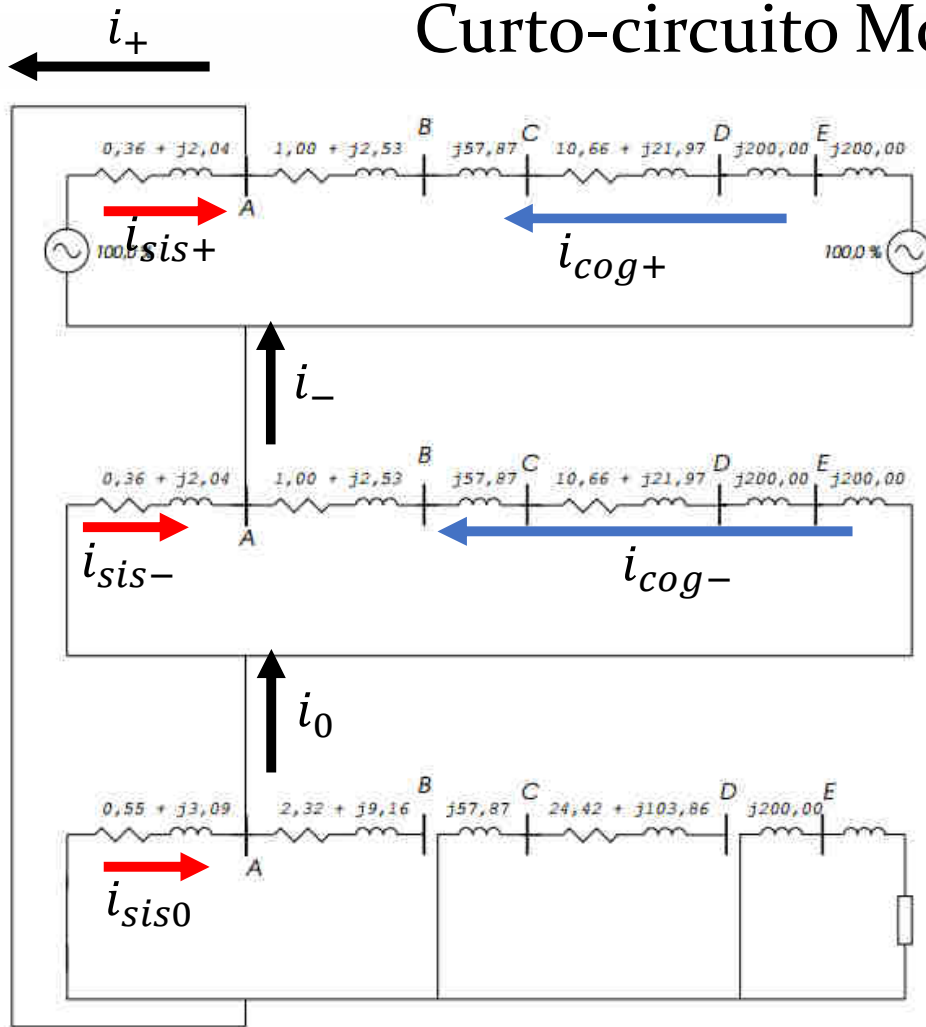
$$z_{eq}^+ = z_{sis}^+ // z_{cog}^+ = 2,06 \angle 80,03^\circ \%$$

$$z_{eq}^+ = z_{eq}^-$$

$$z_{eq}^0 = 3,14 \angle 79,91^\circ \%$$

$$z_{eq}^+ + z_{eq}^- + z_{eq}^0 = 7,26 \angle 79,98^\circ \%$$

Curto-circuito Monofásico – Barra A



$$z_{eq}^+ + z_{eq}^- + z_{eq}^0 = 7,26 \angle 79,98^\circ \%$$

$$i_+ = \frac{100}{z_{eq}^+ + z_{eq}^- + z_{eq}^0}$$

$$i_+ = \frac{100}{7,26 \angle 79,98}$$

$$i_+ = 13,77 \angle -79,98^\circ \text{ pu}$$

Curto-circuito Monofásico – Barra A

$$I_{base}^A = \frac{100 \times 10^6}{\sqrt{3} \times 138 \times 10^3} = 418,37 \text{ A}$$

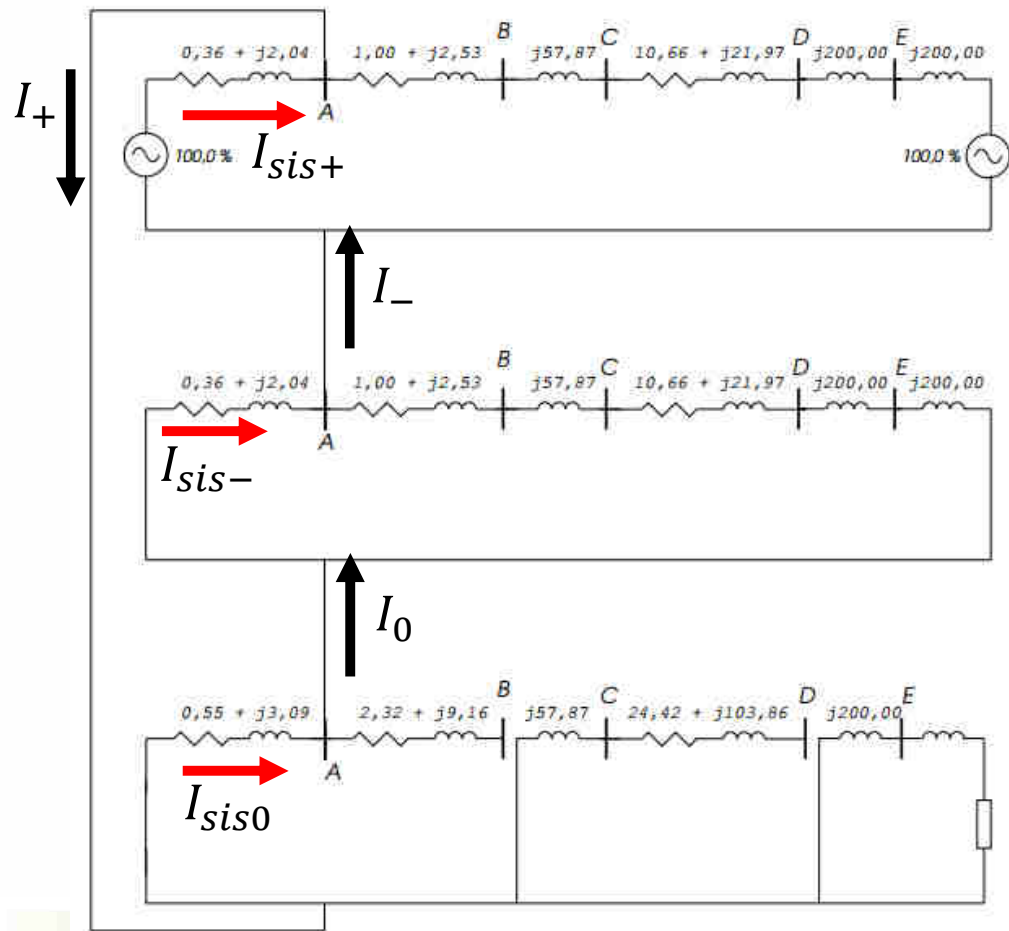
$$I_+ = 13,77 \angle -79,98^\circ \times 418,37 = 5.759 \angle -79,98^\circ \text{ A}$$

$$\begin{bmatrix} I_A^A \\ I_B^A \\ I_C^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} I_{A+}^A \\ I_{A-}^A \\ I_{A0}^A \end{bmatrix}$$

$$\begin{bmatrix} I_A^A \\ I_B^A \\ I_C^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} 5.759 \angle -79,98^\circ \\ 5.759 \angle -79,98^\circ \\ 5.759 \angle -79,98^\circ \end{bmatrix}$$

$$\begin{bmatrix} I_A^A \\ I_B^A \\ I_C^A \end{bmatrix} = \begin{bmatrix} 17.278 \angle -79,98^\circ \\ 0 \\ 0 \end{bmatrix} \text{ A}$$

Curto-circuito Monofásico – Barra A – Contribuição do Sistema



$$I_+ = 5.759 \angle -79,98^\circ \text{A}$$

$$I_{sis+} = 5.759 \angle -79,98^\circ \frac{482,51 \angle 88,62}{2,07 \angle 79,99 + 482,51 \angle 88,62}$$

$$I_{sis+} = 5.731 \angle -79,94^\circ$$

$$I_{sis+} = I_{sis-}$$

$$I_{sis0} = 5.759 \angle -79,98^\circ \text{A}$$

Curto-circuito Monofásico – Barra A – Contribuição do Sistema

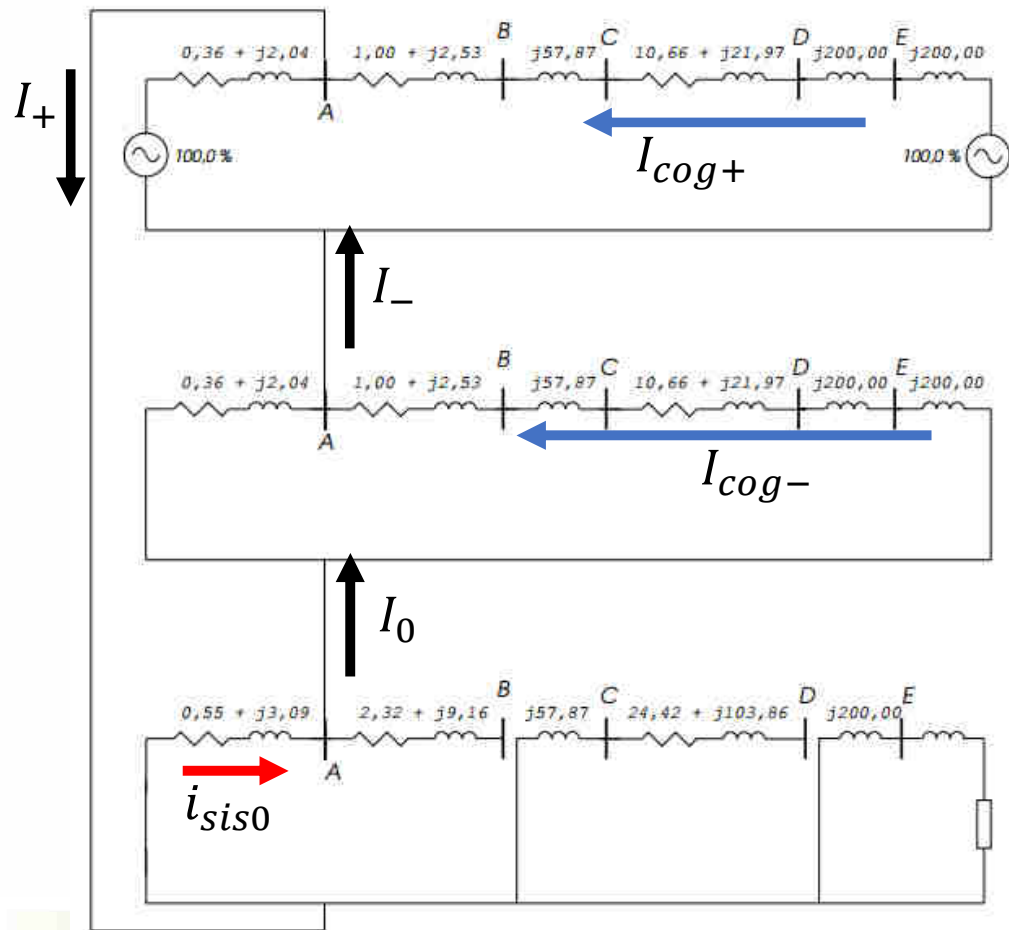
$$I_{sis+} = 5.731 \angle -79,94^\circ$$

$$I_{sis0} = 5.759 \angle -79,98^\circ A$$

$$\begin{bmatrix} I_{sis_A}^A \\ I_{sis_B}^A \\ I_{sis_C}^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} I_{sis+}^A \\ I_{sis-}^A \\ I_{sis0}^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} 5.731 \angle -79,94^\circ \\ 5.731 \angle -79,94^\circ \\ 5.759 \angle -79,98^\circ \end{bmatrix}$$

$$\begin{bmatrix} I_{sis_A}^A \\ I_{sis_B}^A \\ I_{sis_C}^A \end{bmatrix} = \begin{bmatrix} 17.205 \angle -79,94^\circ \\ 24,62 \angle -88,56^\circ \\ 24,62 \angle -88,56^\circ \end{bmatrix} A$$

Curto-circuito Monofásico – Barra A – Contribuição do Co-Gerador



$$I_+ = 5.759 \angle -79,98^\circ \text{ A}$$

$$I_{cog+} = 5.759 \angle -79,98^\circ \frac{2,07 \angle 79,99}{2,07 \angle 79,99 + 482,51 \angle 88,62}$$

$$I_{cog+} = 24,62 \angle -88,56^\circ$$

$$I_{cog+} = I_{cog-}$$

$$I_{cog0} = 0$$

Curto-circuito Monofásico – Barra A – Contribuição do Sistema

$$I_{cog+} = 24,62 \angle -88,56^\circ$$

$$I_{cog0} = 0$$

$$\begin{bmatrix} I_{cog_A}^A \\ I_{cog_B}^A \\ I_{cog_C}^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} I_{sis+}^A \\ I_{sis-}^A \\ I_{sis0}^A \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix} \begin{bmatrix} 24,62 \angle -88,56^\circ \\ 24,62 \angle -88,56^\circ \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} I_{cog_A}^A \\ I_{cog_B}^A \\ I_{cog_C}^A \end{bmatrix} = \begin{bmatrix} 49,24 \angle -88,56^\circ \\ 24,62 \angle 91,44^\circ \\ 24,62 \angle 91,44^\circ \end{bmatrix} A$$



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Obrigado!

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