② $R = G = 0$, $L = 1.33 \times 10^{-7}$, $C = 8.86 \times 10^{-12}$ F/m, $V(0) = \frac{220}{\sqrt{3}} \angle 0°$ kV

$S(0) = 150 + j50$ MVA

a) γ b) Z_c c) V, I, S em 300 km $\omega = 2\pi f = 120\pi$

$$\gamma = \sqrt{zy} = \sqrt{(R + j\omega L)(G + j\omega C)} = j\omega\sqrt{LC} = j4.0925 \times 10^{-7}\ m^{-1}$$

$$Z_c = \sqrt{z/y} = \sqrt{(R + j\omega L)/(G + j\omega C)} = \sqrt{L/C} = 122.5206\ \Omega$$

$l = 300$ km

$$I(0) = \left(\frac{S(0)}{V(0)}\right)^* = \left(\frac{(150 + j50)M}{\frac{220}{\sqrt{3}} \angle 0° \text{ K}}\right)^* = 1244.9913 \angle -18.43°\ A$$

$$\cosh(\gamma x) \approx \cosh(j\beta x) \approx \cos(\beta x)$$

$$\operatorname{senh}(\gamma x) \approx \operatorname{senh} j\beta x \approx j\operatorname{sen}(\beta x)$$

$\gamma = \alpha + j\beta$

$\gamma = 0 + j4.0925 \times 10^{-7}\ m^{-1}$

$\beta = j4.0925 \times 10^{-7}$.

~~$\cos(4.0925 \times 10^{-7} \times 33)$~~

$$V(x) = \frac{220}{\sqrt{3}} \cos(\beta x) - Z_c I_0 j\operatorname{sen}(\beta x) \Rightarrow$$

$$I(x) = I(0) \cos(\beta x) - \frac{V(0)}{Z_c} j\operatorname{sen}(\beta x) \Rightarrow$$

$$V(x) = 127 \times 10^3 \cos(4.0925 \times 10^{-7} \times x) - 150.5371 \times 10^3 \angle -18.43° \operatorname{sen}(4.0925 \times 10^{-7} \times x)$$

$$I(x) = 1244.9913 \angle -18.43° \cos(4.0925 \times 10^{-7} x) - 1036.5604 \operatorname{sen}(4.0925 \times 10^{-7} \times x)$$

$$S(x) = V(x) \times I(x)^*$$

Fazendo $X = l = 300$ km

$V(300) = 121.4402 \angle -8.39$ KV ✓

$I(300) = 1281.3949 \angle -23.82$ A ✓

$S(300) = 155.6128 \angle 15.43$ MVA $= 150 + j41.4024$ MVA ✓

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① $V = 500KV$, $l = 250Km$, Impedância série $= 0.045 + j0.4\ \Omega$ por fase por Km
admitância shunt $= 4j \times 10^{-6}$ S/ por fase por Km

Determine equivalente π e defina a matriz da linha.

$z = 0.045 + j0.4$

Matriz $= \begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 0.9504 + 0.0055j & 10.8778 + 98.3624j \\ -0.0000 + 0.0010j & 0.9504 + 0.0055j \end{bmatrix}$

$y = j4 \times 10^{-6}$

$\gamma = \sqrt{zy} = \sqrt{(0.045 + j0.4)(j4.10^{-6})} = 0.0001 + 0.0013j$

$Z_c = \sqrt{z/y} = \sqrt{(0.045 + j0.4)/(j4 \times 10^{-6})} = 316.73 - 17.760j$

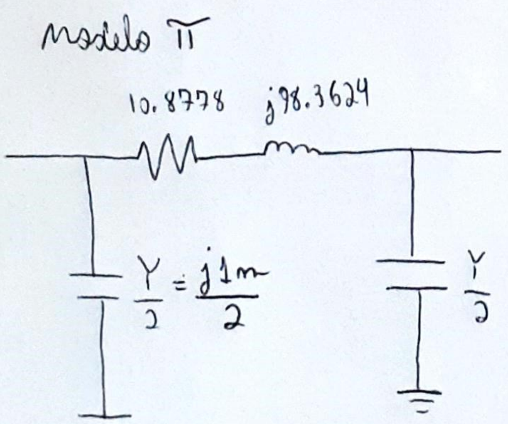
$A = \cosh(\gamma l) = \cosh((0.0001 + 0.0013j)(250)) = 0.9504 + 0.0055j$

$B = Z_c \operatorname{senh}(\gamma l) = (316.73 - 17.76j) \operatorname{senh}(\gamma l) = 10.8778 + 98.3624j$

$C = \frac{1}{Z_c} \operatorname{senh}(\gamma l) = \frac{1}{(316.73 - 17.76j)} \operatorname{senh}(\gamma l) = -0.0000 + 0.0010j$

$D = \cosh(\gamma l) = \cosh(\gamma l) = 0.9504 + 0.0055j$

modelo π



$Z = B$

$Y = \frac{2}{Z_c} \operatorname{tgh}\left(\frac{\gamma l}{2}\right) = 0.0000 + 0.0010j$