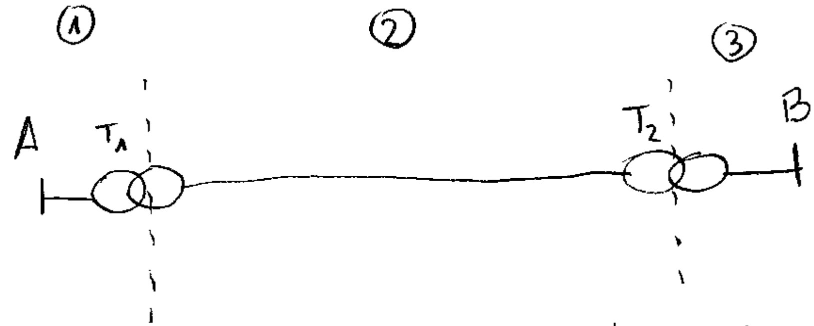
I



1)

Para que en p.u. nos quede un trafo de relación 1:1 ⇒

$$\begin{cases} \dfrac{V_{Base2}}{V_{Base1}} = \dfrac{V_{PT1}}{V_{ST1}} \quad y \quad \dfrac{V_{Base2}}{V_{Base3}} = \dfrac{V_{PT2}}{V_{ST2}} \\ S_{Base1} = S_{Base2} = S_{Base3} \end{cases}$$

Elijo: $\begin{cases} S_{base} = 200\,MVA \\ U_{base1} = 150\,kV \end{cases}$

$$\Rightarrow U_{Base2} = \frac{500}{150} \times 150 = 500\,kV$$

$$\Rightarrow U_{Base3} = \frac{150}{525} \times 500 = 142{,}86\,kV$$

Impedancias trafos: $Z_{base2} = \dfrac{U_{base2}^2}{S_{Base2}} = \dfrac{500^2}{200} = 1250\,\Omega$

→ Como los valores base son iguales a los nominales de T_1 ⇒ $x_{T1} = 0{,}02$ p.u.

→ no es así para T_2 → $x_{T2} = 0{,}02 \times \dfrac{525^2}{200} \times \dfrac{1}{Z_{base2}} = 0{,}022$ p.u.

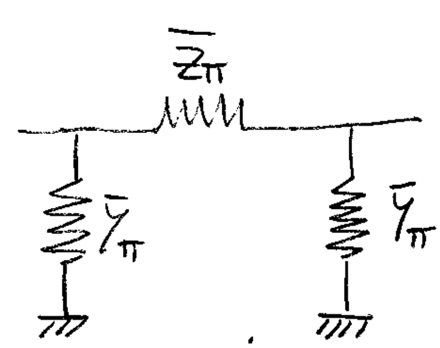
2)

$$\begin{cases} \bar{z} = (r + j\omega l) \cdot L \cdot \dfrac{1}{Z_{base2}} \\ \bar{y} = (g + jc\omega) \cdot L \cdot \dfrac{1}{Y_{base2}} \longrightarrow Y_{base2} = \dfrac{1}{Z_{base2}} \end{cases} \Rightarrow \begin{cases} \bar{z} = 0{,}016 + j0{,}131 \text{ p.u.} \\ \bar{y} = j1{,}571 \text{ p.u.} \end{cases}$$

$$\bar{\theta} = \sqrt{\bar{z}\bar{y}} = 0{,}028 + j0{,}454$$

$$\bar{Z}_\pi = \bar{z} \cdot \frac{\sinh(\bar{\theta})}{\bar{\theta}} = 0{,}015 + j0{,}126 \text{ p.u.}$$

$$\bar{Y}_\pi = \bar{y} \cdot \frac{\cosh(\bar{\theta}) - 1}{\bar{\theta} \cdot \sinh(\bar{\theta})} = 0{,}002 + j0{,}799 \text{ p.u.}$$



3) Despreciendo impedancias de los trafos, sólo nos queda la línea.

p.u.
$$\begin{cases} \bar{A} = \cosh(\bar{\Theta}) = 0{,}899 + j\,0{,}012 \\ \bar{B} = \bar{Z}\cdot\dfrac{\sinh(\bar{\Theta})}{\bar{\Theta}} = 0{,}015 + j\,0{,}126 \text{ p.u.} \\ \bar{C} = \bar{Y}\cdot\dfrac{\sinh(\bar{\Theta})}{\bar{\Theta}} = -0{,}006 + j\,1{,}518 \text{ p.u.} \\ \bar{D} = \cosh(\bar{\Theta}) = 0{,}899 + j\,0{,}012 \end{cases}$$

$$\bar{S}_A = 150 - j\,50 \text{ MVA} \Rightarrow \bar{s}_A = 0{,}75 - j\,0{,}25 \text{ p.u.}$$

Usando formula compleja $\bar{u}_B = \bar{D}\,u_A - \dfrac{\bar{B}\,\hat{s}_A}{u_A}$ $\rightarrow$ $\bar{u}_A = \dfrac{150\text{ kV}}{150\text{ kV}} = 1$ p.u.

$\Rightarrow u_B = 0{,}923$ pu $\rightarrow$ la barra B esta en la zona 3

$$\Rightarrow \boxed{U_B = u_B \times U_{base3} = 131{,}9 \text{ kV}}$$

ahora hallo P_B usando formula compleja:

$$\bar{s}_B = \hat{A}\cdot\bar{D}\cdot\bar{s}_A + \bar{B}\cdot\hat{C}\cdot\hat{s}_A - \hat{C}\cdot\bar{D}\cdot u_A^2 - \frac{\hat{A}\cdot\bar{B}\,s_A^2}{u_A^2} = 0{,}734 + j\,1{,}122 \text{ p.u.}$$

$\Rightarrow p_B = 0{,}734$ $\quad$ $perd = p_A - p_B = 0{,}75 - 0{,}734 = 0{,}016$ p.u.

$$\boxed{P_{perd} = 0{,}016 \times P_{base} = 3{,}2 \text{ MW}}$$