Parcial 2 - 2009

Ej 1

Modelado de Componentes Nivel de Tensión 150 kv

T1 a T3:

$x_p = 0{,}05$ pu
$x_s = 0{,}01$ pu
$x_t = 0{,}08$ pu

en Ω ⇒ $X_p = 0{,}05 \cdot \frac{150^2}{40} = 28{,}1$ Ω

$X_s = 5{,}63$ Ω

$X_t = 45$ Ω

G:

$X_{gs} = X_{gp} = 0{,}2 \times \frac{150^2}{50} = 90\,j$ (Ω)

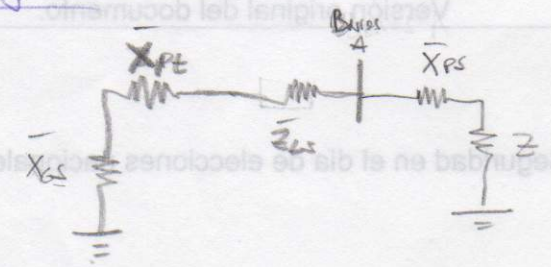
$X_{go} = 0{,}14 \times \frac{150^2}{50} = 63\,j$ (Ω)

Impedancia:

$Z_{0\,150} = 80{,}7$ Ω

Impedancias Thevenin

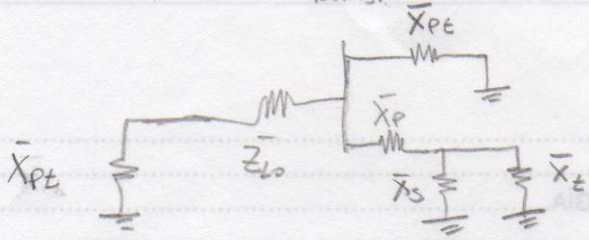
$\bar{Z}_s$ y $\bar{Z}_o$:



$$\bar{Z}_s = \bar{Z}_o = (\bar{Z}_{LS} + \bar{X}_{Pt} + \bar{X}_{GS}) \parallel (\bar{X}_{PS} + \bar{Z}) = 72{,}4\,j \quad (\Omega)$$

$$\bar{f}_o = \frac{\bar{Z}_s}{(\bar{X}_{GS} + \bar{X}_{PS})} = 0{,}4182$$

Z_o



$$\bar{Z}_o = \left[\left(\bar{Z}_{Lo} + \bar{X}_{Pt} \right) /\!/ \, \bar{X}_{Pt} \right] /\!/ \left[\bar{X}_P + \bar{X}_S /\!/ \bar{X}_t \right] = 18{,}7\,j \ (\Omega)$$

$$\bar{f}_h = \frac{\bar{Z}_o}{\left(\bar{X}_{Pt} + \bar{Z}_{Lo} \right)} = 0{,}181$$

Corrientes y Tensión antes del defecto

Corriente por el relé: $\bar{I}_{od_1} = \dfrac{155000/\sqrt{3}}{\left(\bar{X}_P + \bar{X}_S + \bar{Z} \right)} = -719\,j \ (A)$

Fase 1

Tensión en el relé: $\bar{U}_{od_1} = \dfrac{155000}{\sqrt{3}} + \bar{I}_{od} \cdot \bar{Z}_{LS} = 96680 \ V$

Fase 1 — Fase Neutro

Corrientes:

$$\bar{I}_{fn} = \frac{155000/\sqrt{3}}{\left(\bar{Z}_S + \bar{Z}_a + \bar{Z}_o \right)} = -547{,}4\,j \ (A)$$

$\bar{I}_d = \bar{f}_d \cdot \bar{I}_{fn} = -229\,j \ (A)$; $\bar{I}'_d = \bar{I}_d + \bar{I}_{od} = -948\,j \ (A)$

$\bar{I}_i = \bar{I}_d$

$\bar{I}_h = \bar{f}_h \cdot \bar{I}_{fn} = -99{,}1\,j \ (A)$

$\bar{I}_1 = -1276\,j \ (A)$ $\quad \boxed{I_1 = 1276 \ (A)}$

$\bar{I}_2 = -623 + 489\,j \ (A)$

$\bar{I}_3 = 623 + 489\,j \ (A)$

Tensión del Relé: (Fase Neutro)

$$\bar{U}_d = -\bar{I}_d.(\bar{X}_{gs}+\bar{X}_p+\bar{X}_t) + \bar{U}_{100} = 59335 \quad (V)$$

$$\bar{U}_i = -\bar{I}_i.(\bar{X}_{gs}+\bar{X}_p+\bar{X}_t) = -37345 \quad (V)$$

$$\bar{U}_h = -\bar{I}_h(\bar{X}_p+\bar{X}_t) = -7247 \quad (V)$$

$$\bar{U}_1 = 14742 \quad (V)$$

Cálculo Z_v

$$\bar{Z}_v = \frac{\bar{U}_1}{\bar{I}_1 + 2.\bar{I}_h} = 10\,j \quad (\Omega)$$