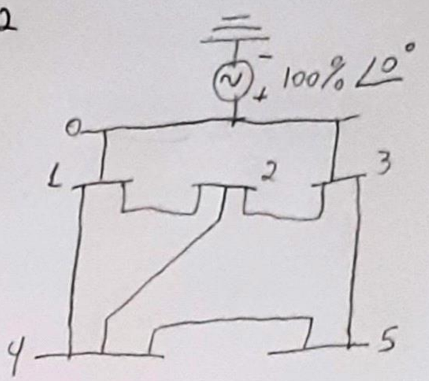
P3 - ELT 441

Nome: Weriton F. de O. Alves

Matrícula: 96708   Data: 07/03/2022



Questão 1) sistema de 5 barras:

$V_B = 500V$

a) curto monofásico na barra 5

b) V_A, V_B, V_C na barra 2

c) I_A, I_B, I_C nas linhas 1 - 2

a) Assumindo $S_B = 100MVA$, temos:

$Z^{+}_{5,5} = 3.4166j$ | $i_{A+} = i_{A-} = i_{A0}$

$Z^{0}_{5,5} = 7.8556j$ | $i_A = i_{A+} + i_{A-} + i_{A0} = 3i_{A+} = \dfrac{3 \times 100}{2 \times 3.4166j + 7.8556j} \Rightarrow$

$$\boxed{i_A = -20.424j \text{ pu} \quad e \quad i_{A+} = -6.808j \text{ pu}}$$

$I_{Base} = \dfrac{100 \times 10^6}{\sqrt{3}\ 500} = 115470 A \Rightarrow I_A = I_{Base} \cdot i_A = -2.358j\ MA$

como o curto é monofásico, temos que $I_B = 0$ e $I_C = 0$ A

b) $Z^{+}_{2,5} = 1.7174j$ | $v_A = 1 - \left(\dfrac{2 \times Z^{+}_{2,5} + Z^{0}_{2,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = 0.680$ pu

$Z^{0}_{2,5} = 1.2647j$ | $v_B = a^2 - \left(\dfrac{Z^{0}_{2,5} - Z^{+}_{2,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = 0.985 \angle -118.45°$ pu

$V_{Base} = \dfrac{500}{\sqrt{3}} = 288.675V$ | $v_C = a - \left(\dfrac{Z^{0}_{2,5} - Z^{+}_{2,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = 0.985 \angle 118.45°$ pu

Logo, as tensões de fase são:

$V_{A_2} = v_A \times V_{Base} = 196.317 \angle 0$ V

$V_{B_2} = v_B \times V_{Base} = 284.33 \angle -118.45°$ V

$V_{C_2} = v_C \times V_{Base} = 284.33 \angle 118.45°$ V

c) $Z^{+}_{1,5} = 1.2161j$

$Z^{0}_{1,5} = 0.2605j$

$Z^{+}_{2,5} = 1.7174j$

$Z^{0}_{2,5} = 1.2647j$

$z^{+}_{1,2} = 2.47j$

$z^{0}_{1,2} = 10.63j$

$$i_{1,2+} = \frac{100}{z^{+}_{1,2}}\left(\frac{Z^{+}_{2,5} - Z^{+}_{1,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = -0.0138j \text{ pu}$$

$$i_{1,2-} = \frac{100}{z^{+}_{1,2}}\left(\frac{Z^{+}_{2,5} - Z^{+}_{1,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = -0.0138j \text{ pu}$$

$$i_{1,20} = \frac{100}{z^{0}_{1,2}}\left(\frac{Z^{0}_{2,5} - Z^{0}_{1,5}}{2Z^{+}_{5,5} + Z^{0}_{5,5}}\right) = 0 \text{ pu}$$

$$I_{Base} = \frac{100\times10^6}{\sqrt{3}\,500} = 115\,470 A$$

$$\begin{bmatrix} i_{1,2A} \\ i_{1,2B} \\ i_{1,2C} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ a^2 & a & 1 \\ a & a^2 & 1 \end{bmatrix}\begin{bmatrix} i_{1,2+} \\ i_{1,2-} \\ i_{1,20} \end{bmatrix} = \begin{bmatrix} -3.407j \\ 0.739j \\ 0.739j \end{bmatrix} \text{ pu}$$

$I_A = I_{Base} \times i_{1,2A} = 393.353 \angle -90^\circ$ KA

$I_B = I_{Base} \times i_{1,2B} = 85.282 \angle 90^\circ$ KA

$I_C = I_{Base} \times i_{1,2C} = 85.282 \angle 90^\circ$ KA

Questão 2 | curto monofásico no barra H. Calcule I_A, I_B, I_C

$S_B = 100MVA$ $\quad 9+6+7+0+8 = 30 \Rightarrow$

$z^+_{HL} = z^0_{HL} = j30\%$

$z_{HL} = 30j \times \frac{100M}{25M} = 120j\%$

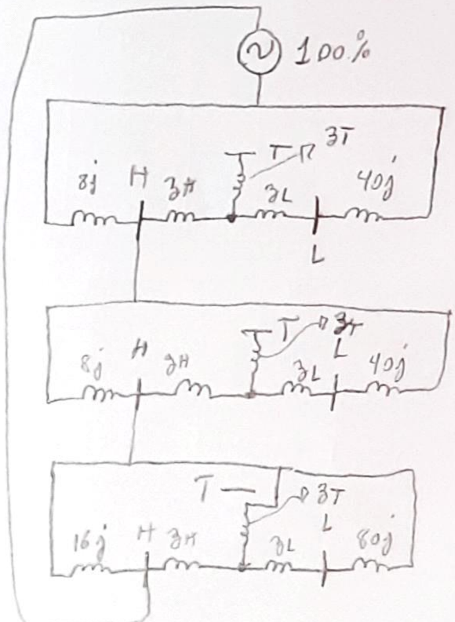
$z_{HT} = 5.99j \times \frac{100M}{8.75M} = 68.457j\%$

$z_{LT} = 3.7j \times \frac{100M}{8.75M} = 42.286j\%$

$z_H = \frac{z_{HL} + z_{HT} - z_{LT}}{2} = 73.086j\%$ pu

$z_L = \frac{z_{HL} - z_{HT} + z_{LT}}{2} = 46.914j\%$ pu

$z_T = \frac{-z_{HL} + z_{HT} + z_{LT}}{2} = -4.629j\%$ pu



$Z^0_2 = z_H + \frac{z_T(z_L + 80j)}{z_T + z_L + 80j} = 68.282\angle 90°$

Dado o circuito ao lado, com curto monofásico, temos:

$Z^+_1 = 8j$ pu $\quad Z^0_1 = 16j$ pu

$Z^+_2 = 160j$ pu $\quad Z^0_2 = 68.282$ pu

$Z^+_{eq} = \frac{Z^+_1 Z^+_2}{Z^+_1 + Z^+_2} = 7.619j$ pu $\quad Z^0_{eq} = \frac{Z^0_1 Z^0_2}{Z^0_1 + Z^0_2} = 12.963j$ pu

$i^+_A = \frac{100}{2 \times 7.619j + 12.963j} = -3.546j$ pu

$i^+_A = i^-_A = i^0_A$

$i_A = 3 \times i^+_A = -10.638j$ pu

$i_B = i_C = 0$ pu

$I_{Base} = \frac{100M}{\sqrt{3}\, 138k} = 418.37\,A$

$I_A = I_{Base} \times i_A = 4450.636\angle -90°\,A$

$I_B = I_C = 0\,A$