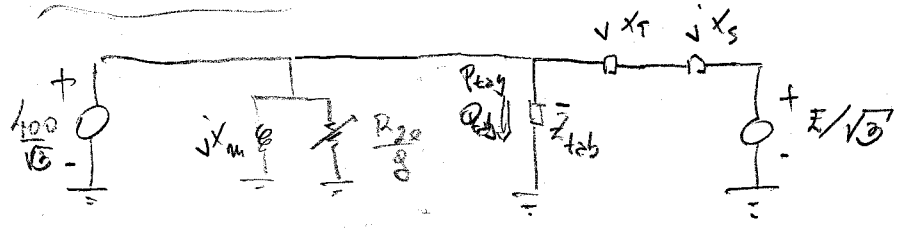
IE

01/07/2012

Problema 1



$X_T = 0{,}05 \cdot \frac{400^2}{500\times10^3} = 0{,}016\,\Omega$

$X_S = \left(\frac{400}{6300}\right)^2 \cdot 0{,}2 \cdot \frac{6300^2}{300\times10^3} = 0{,}107\,\Omega$

$X = X_T + X_S = 0{,}123\,\Omega$

$X_m = \frac{400/\sqrt{3}}{100} = 2{,}3\,\Omega$

$220\times10^3 = g_N(1-g_N)\frac{400^2}{R_{2e}}$ $\quad g_N = \frac{1500-1455}{1500} = 0{,}03 \Rightarrow R_{2e} = 0{,}0146\,\Omega$

$I_{NMI} = \sqrt{\left(\frac{400/\sqrt{3}}{0{,}0140}\times 0{,}03\right)^2 + 100^2} = 485\,A$

$P_{tab} = 40\,KW \qquad Q_{tab} = 40 \times tg(\arccos 0{,}7) = 40{,}8\,KVAR$

2)

$C_{MI} = \frac{400^2}{0{,}0146\times157}\,g = 0{,}95\times1500\,(1-g) \Rightarrow g = 0{,}02$

$P_{MI} = 0{,}02(1-0{,}02)\frac{400^2}{0{,}0146} = 214{,}8\,KW$

$Q_{MI} = \frac{400^2}{2{,}3} = 69{,}6\,KVAR$ $\Rightarrow \cos\varphi_{MI} = 0{,}95$

$P_{tot} = 40 + 214{,}8 = 254{,}8\,KW$

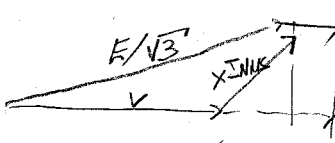
$Q_{tot} = 40{,}8 + 69{,}6 = 110{,}4\,KVAR$ $\Rightarrow \cos\varphi_{red} = 0{,}92$ ind.

3)

$\cos\varphi_{red} = 0{,}95 \Rightarrow Q_{red} = P_{red}\,tg\,\varphi_{red} \Rightarrow Q_{MS} = 110{,}4 - Q_{red}$

$P_{MS}^{max} = 200\,KW \Rightarrow P_{red} = 254{,}8 - 200 = 54{,}8\,KW \Rightarrow Q_{red} = 18\,KVAR$

$\Rightarrow Q_{MS} = 110{,}4 - 18 = 92{,}4\,KVAR$



$\tilde{P} = \frac{200\times10^3}{\sqrt{3}\,400}\times 35{,}5$

$\tilde{Q} = \frac{92{,}4\times10^3}{\sqrt{3}\times400}\times 16{,}4$

$E = \sqrt{3}\,V\sqrt{(16{,}4+231)^2 + 35{,}5^2}$

$E = \sqrt{3}\times250\,V = 432{,}5\,V$ (400)

$\Rightarrow E' = 681{,}9$

$\Rightarrow \underline{i = 3{,}4\,A}$

4)

$\bar{I}_{MI} = \frac{400/\sqrt{3}}{0{,}0146}\times 0{,}02 + j100 = 317 + j100 \Rightarrow I_{MI} = 332{,}4\,A \Rightarrow 68{,}5\%$

$I_{MS} = \frac{\sqrt{200^2 + 92{,}4^2}\times1000}{\sqrt{3}\,400} = 318{,}4\,A$ $\qquad I_{NMS}^{400} = \frac{300\times10^3}{\sqrt{3}\,400} = 433{,}5\,A \Rightarrow 73{,}4\%$

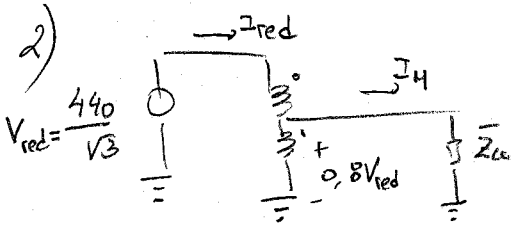
Ejercicio 2

1)

a) $\bar{Z}_{cc} = \frac{50/\sqrt{3}}{185} \angle \arccos\left(\frac{7500}{\sqrt{3}\times 50\times 185}\right) = 0{,}16 \angle 62° = (0{,}075 + j\,0{,}14)\,\Omega$.

$R_1 = \frac{12}{200} = 0{,}06\,\Omega$ $\quad R_{2e} = 0{,}015\,\Omega$ $\quad X_1 + X_{2e} = 0{,}14\,\Omega$

2)

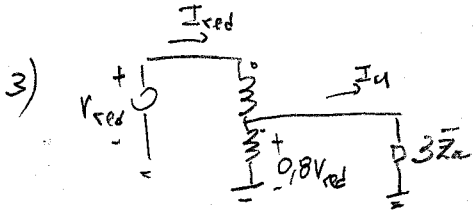


$\Rightarrow I_M = \frac{440}{\sqrt{3}} \times 0{,}8 = 1271{,}7\,A.$

$I_{red} = 0{,}8 \cdot I_M = 1017{,}4\,A.$

$C_{Air} = \frac{3}{\omega_s} R_{2e} I_M^2 = 463{,}5\ N\times m$

3)



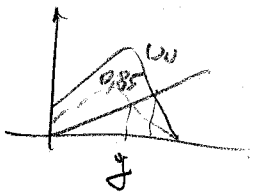
$I_M = \frac{440}{\sqrt{3}\times 3\bar{Z}_{cc}} \times 98 = 424\,A.$

$I_{red} = 339{,}2\,A$

4)

$U_{max} = 1{,}1 \times 440 = 484\,V$ $\quad U_{min} = 0{,}85 \times 440 = 374\,V$

I_{max} cuando U_{min}



$\frac{374^2 \times s}{157 \times 0{,}015} = 0{,}8 \times 1500\,(1-s) \Rightarrow s = 0{,}02 \Rightarrow n = 1500(1-0{,}02) = 1470$ rpm

$\bar{I}_{2e_{max}} = \frac{374/\sqrt{3}}{0{,}015} \times 0{,}02 = 288{,}2\,A$ $\quad \bar{I}_0 = 8{,}5 \times \frac{374}{440} \angle -90° = 7{,}2 \angle -90°$

$\bar{I} = \bar{I}_0 + \bar{I}_{2e_{max}} \Rightarrow I = \sqrt{288{,}2^2 + 7{,}2^2} = 288{,}3\,A$

Corriente nominal: $s_N(1-s_N)\frac{440^2}{0{,}015} = 275 \times 745 \Rightarrow s_N = 0{,}016$

$\bar{I}_{2e_N} = \frac{440/\sqrt{3}}{157 \times 0{,}015} \times 0{,}016 = 271{,}3 \angle 0°\,A$ $\quad \bar{I}_0 = 8{,}5 \angle -90°$

$I_N = \sqrt{271{,}3^2 + 8{,}5^2} = 271{,}4\,A$

% carga $\frac{288{,}3}{271{,}4} \Rightarrow 106\%$ de carga