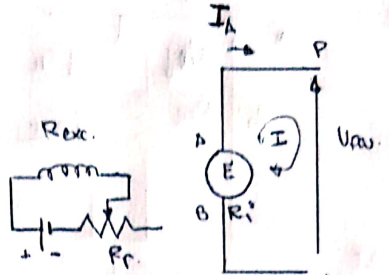
...UEZ PEREZ, Juan Manuel
Mecatrónica ; Leg: 13567

(1) $n = 970$ rpm.
$V_{PN} = 440$ V
$I_A = 125$ A
$R_i = 0{,}12\ \Omega$.
$N = 992$
a) $P = 2$.



Conductor por conductor. ¿?
Devanado imbricado: $2a = 2p$
$a = p \rightarrow a = 2$.
Luego $i = I_a / 2a = 125\,A / 2 \cdot 2 = 125\,A / 4 =$ **31,25 A**

b) Ley de Kirchhoff en malla I.
$-V_{PN} + E - I_A \cdot R_i = 0$.
$E = I_A \cdot R_i + V_{PN}$.
$E = 125\,A \cdot 0{,}12\,\Omega + 440\,V =$ **455 V**

c) ~~$E = k_E \cdot \Phi \cdot n \rightarrow \Phi = \frac{E}{k_E \cdot n}$~~

$E = k_E \Phi n \rightarrow \Phi = \frac{E}{k_E n}$

Tenemos $k_E = \frac{Np}{60a} = \frac{992 \cdot 2}{60 \cdot 2} = 16{,}53 \frac{V}{wb}$

$\Phi = \frac{455\,V}{16{,}53 \frac{V_{min}}{wb} 970\,rpm} =$ **28,37 mWb**

d) En vacío no hay caída de tensión en R_i
Luego: **$V = E = 455$ V**

e) $E = k_E \cdot \Phi n \rightarrow n = \frac{E}{k_E \Phi} = \frac{440\,V}{16{,}53 \frac{V_{min}}{wb} 28{,}37\,mWb} =$ **938,02 rpm**

f) $\Phi = \frac{E}{k_E n} = \frac{440\,V}{16{,}53 \frac{V_{min}}{wb} 970\,rpm} =$ **27,44 mWb**

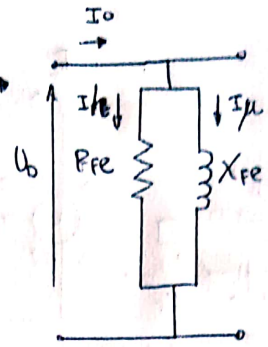
BARQUEZ PEREZ, Juan Manuel
Mecatrónica; Leg: 13567

2) 10 kVA DATOS

220/380 V 50 Hz

$U_o = 220$ V
$I_o = 2$ A
$P_{Fe} = 150$ W
} BT

$U_{cc} = 10$ V
$I_{cc} = I_n = 26{,}32$ A
$P_{cc} = 75$ W.
} AT



vacío.

a) Parámetros reducidos al primario.

El primario es el lado de baja tensión en este caso porque está dada la relación de transformación.

En vacío las pérdidas de potencia activa son el el núcleo del transformador.

$I_h^2 \cdot R_{Fe} = P_{Fe}$.

$(I_o \cos\varphi_o)^2 R_{Fe} = P_{Fe}$.

$$R_{Fe} = \frac{P_{Fe}}{(I_o \cos\varphi_o)^2}$$

$$\cos\varphi_o = \frac{P_{Fe}}{S} = \frac{150\text{ W}}{220\text{ V} \cdot 2\text{ A}} = 0{,}34.$$

$\varphi_o = 70{,}07°$ en retraso.

Luego: $R_{Fe} = \frac{150\text{ W}}{(2\text{ A} \cdot 0{,}34)^2} = 322{,}67\ \Omega$ R_{Fe}.

$$Z_o = \frac{U_o}{I_o} = \frac{220\text{ V}}{2\text{ A}} = 110\ \Omega \rightarrow Z_o = 110\ \Omega\ \angle -70{,}07°$$

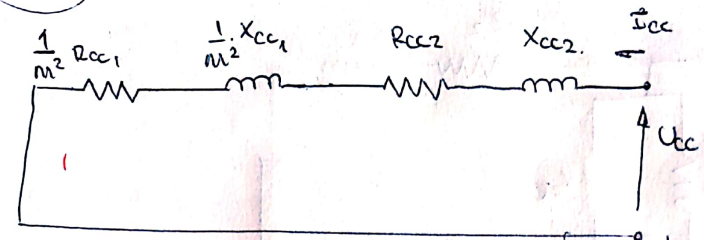
Z_o.

$I_\mu^2 \cdot X_{Fe} = Q_o$.

$$\frac{U_o^2}{X_{Fe}} = Q_o \rightarrow \frac{U_o^2}{Q_o} = X_{Fe} = \frac{U_o^2}{S \cdot \operatorname{sen}\varphi_o} = \frac{(220\text{ V})^2}{220\text{ V} \cdot 2\text{ A} \cdot \operatorname{sen} 70{,}07°}$$

$X_{Fe} = 117\ \Omega$

BORQUEZ PEREZ, Juan Manuel.
Leg: 13567 ; Mecatrónica.



Despreciamos la rama en derivación en cortocircuito.

$R_{cc} = \frac{1}{m^2} \cdot R_{cc1} + R_{cc2}$

$P_{cc} = I_{cc}^2 \cdot R_{cc} \rightarrow R_{cc} = \frac{P_{cc}}{I_{cc}^2} = \frac{75\ W}{(26,32\ A)^2} = 0,1083\ \Omega.$

$R_{cc2} = R_{cc}/2 = 54,13\ m\Omega = \frac{1}{m^2} \cdot R_{cc1}$

$S = U_{cc} \cdot I_{cc} = 10\ V \cdot 26,32\ A = 263,2\ VA.$

$\cos \varphi_{cc} = \frac{75\ W}{263,2\ VA} = 0,28 \rightarrow \varphi_{cc} = 73,44°.$

$Q_{cc} = S \cdot \operatorname{sen} \varphi_{cc} = 263,2\ VA \cdot \operatorname{sen} 73,44° = 252,29\ VAR.$

$q_{cc} = X_{cc} \cdot I_{cc}^2 \rightarrow X_{cc} = \frac{Q_{cc}}{I_{cc}^2} = \frac{252,29\ VAR}{(26,32\ A)^2} = 0,364\ \Omega.$

$X_{cc2} = X_{cc}/2 = 0,182\ \Omega = \frac{1}{m^2} \cdot X_{cc1}$

Luego $X_{cc1} = m^2 \cdot 0,182\ \Omega = 61,03\ m\Omega$ X_{cc1}

$m = \frac{220}{380} = 0,58.$

$R_{cc1} = 54,13\ m\Omega\ (0,58)^2 = 18,2\ m\Omega$ R_{cc1}

$m^2 R_{cc2} = 18,2\ m\Omega.$

$m^2 X_{cc2} = 61,03\ m\Omega.$

$R_0 = 322,67\ \Omega.$
$Z_0 = 110\ \Omega\ \angle -70,07°$
$X_0 = 117\ \Omega$

$R_1 = 18,2\ m\Omega = R_{21}$
$X_1 = 61,03\ m\Omega = X_{21}$

$\sqrt{3} \cdot I_L \cdot U_L$ = 30. 40W

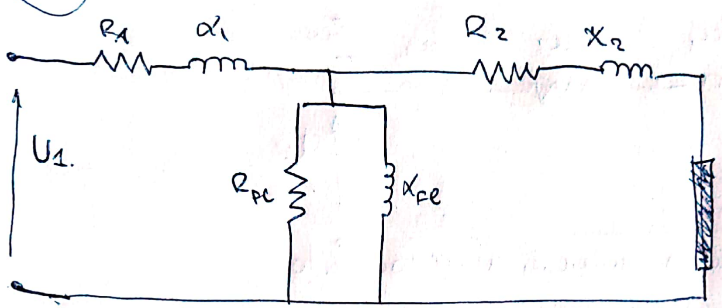
30x40W → I_L = 30x40W

Leg: 13567; Mecatrónica.

(3)

BORQUEZ PEREZ, Juan Manuel
Leg: 13567; Mecatrónica.

(4)



b) Si el ensayo de cortocircuito se realiza en el primario tenemos.

~~$U_R = I_{cc} \cdot R_{cc} \rightarrow U_{R\%} = \frac{U_R}{U_n} = \frac{I_{cc}^2 \cdot R_{cc} \cdot 100}{I_{cc} \cdot U_n}$~~

~~$U_R\% = \frac{P_{cc} \cdot 100}{S}$~~

$$U_R\% = \frac{I_n \cdot R_{cc}}{U_n} \cdot 100 = \frac{45{,}45\,A \cdot 36{,}4\,m\Omega \cdot 100}{220\,V}$$

$U_R\% = 0{,}75\%$

$$U_X\% = \frac{I_n \cdot X_{cc}}{U_n} \cdot 100 = \frac{45{,}45\,A \cdot 0{,}123\,\Omega \cdot 100}{220\,V} = 2{,}53\,\%$$

$\Delta U\% = U_R\% \cdot \cos\varphi + U_X\% \cdot \operatorname{sen}\varphi$.

$\Delta U\% = 0{,}75 \cdot 0{,}8 + 2{,}53 \cdot 0{,}6 = 2{,}12$.

$$\Delta U\% = \frac{U_{20} - U_2}{U_{20}} \cdot 100 \rightarrow U_2 = -\frac{\Delta U\% \, U_{20}}{100} + U_{20}.$$

$$U_2 = U_{20} \cdot \left(1 - \frac{\Delta U\%}{100}\right)$$

$$U_2 = 380\,V \left(1 - \frac{2{,}12}{100}\right) = \boxed{371{,}95\,V}$$

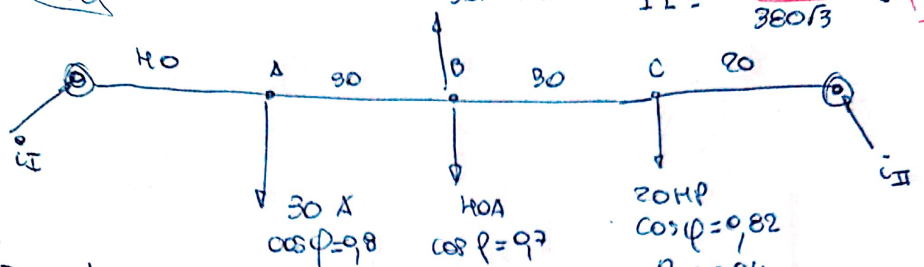
3). $\Delta U\% = 3\%$.
$U_C = 380\,V$.
$T = 15\,°C$.

Escaneado con CamScanner

BARQUEZ PEREZ, Juan Manuel
Leg: 15567; Mecatrónica.

30x40W → $\sqrt{3}\, I_L \cdot U_L = 30 \cdot 40W$ (5)

$I_L = \frac{30 \times 40W}{380\sqrt{3}} = 1{,}82A$



$\underline{i}_I = \frac{1}{L} \cdot \sum (i_k \cdot L_k)_{II} =$

motor · $\sqrt{3} \cdot U_L \cdot I_L \cdot \cos\varphi = \frac{20HP \cdot \frac{746W}{1HP}}{0{,}84}$

$I_L = \frac{20HP \cdot \frac{746W}{1HP}}{380V \; 0{,}84 \cdot 0{,}82 \cdot \sqrt{3}} = 32{,}91A.$

$\underline{i}_I = \frac{1}{120} (30A \cdot 60 + 1{,}82A \cdot 50 + 40A \cdot 50 + 32{,}91A \cdot 20)$

$\underline{i}_I = 42{,}91A.$

$I_B = \sum i_k - \underline{i}_I = 30A + 1{,}82A + 40A + 32{,}91A - 42{,}91A$
$= 61{,}82A.$

Determinamos el punto de corte.