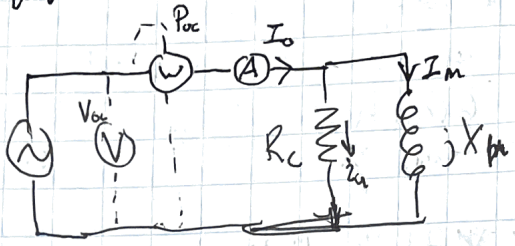
Prelab 2 Xformer Approximation

Equiv Circuit Parameters

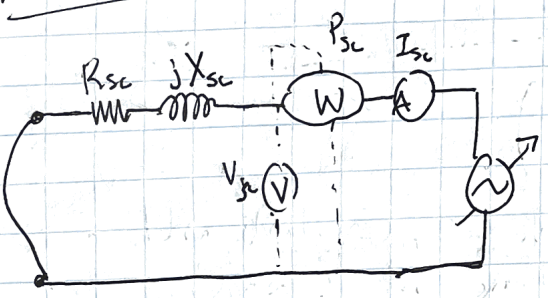


$$R_c = \frac{V_{in,oc}^2}{P_{loss}}$$ OC Test

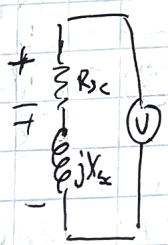
$$I_a = \frac{V_{in}}{R_c} \qquad I_m = \sqrt{I_o^2 - I_a^2}$$

$$X_\mu = \frac{V_{in}}{I_m} = \frac{V_{in}}{\sqrt{I_o^2 - I_a^2}} = \frac{V_{in}}{\sqrt{I_o^2 - \left(\frac{V_{in}}{\frac{V_{in}^2}{P_{loss}}}\right)^2}}$$

$$X_\mu = \frac{V_{in,oc}}{\sqrt{I_o^2 - \left(\frac{P_{loss}}{V_{in,oc}}\right)^2}}$$ OC Test



$$R_{sc} = \frac{P_{sc}}{I_{sc}^2}$$



$$X_{sc} = \sqrt{Z_{sc}^2 - R_{sc}^2}$$

$$V_{sc} = Z_{sc} I_{sc} \qquad Z_{sc} = R_{sc} + jX_{sc} \qquad V_{sc} = \sqrt{V_a^2 + V_m^2}$$

$$V_{sc} = R_{sc} I_{sc} + jX_{sc} I_{sc} \qquad I_m X_{sc} = V_{sc} \qquad \frac{V_m}{I_{sc}} = \frac{\sqrt{V_{sc}^2 - V_a^2}}{I_{sc}} = X_{sc}$$

V_a = $R_{sc} I_{sc}$, V_m = $jX_{sc} I_{sc}$

$$X_{sc} = \frac{V_{sc}}{\sqrt{V_{sc}^2 - V_a^2}} = [illegible]$$

$$V_a = R_{sc} I_{sc} = \frac{P_{sc}}{I_{sc}^2} I_{sc}$$

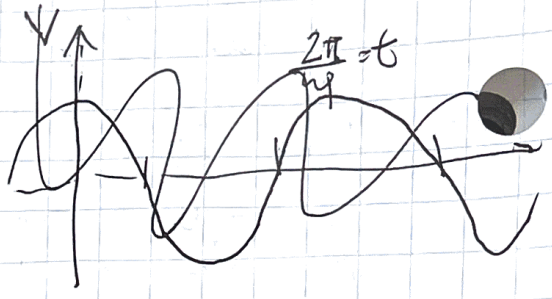
$$X_{sc} = \frac{\sqrt{V_{sc}^2 - \left(\frac{P_{sc}}{I_{sc}}\right)^2}}{I_{sc}}$$

$$a = \frac{V_{oc,HV}}{V_{oc,LV}}$$

Lab 2 Prelab Pt 2

Current in an ideal inductor being supplied by a sinusoidal voltage

$$V = L\frac{di}{dt} \quad \text{if} \quad V = V_0 \sin(\omega t)$$



a) The inductor is energized when the Applied Voltage is at its peak

@ Peak = $t = 0, \frac{2\pi}{\omega}, \ldots$

$$i = \frac{1}{L}\int V\,dt = \frac{1}{L}\int \frac{V_0}{\omega}\sin(\omega t)$$

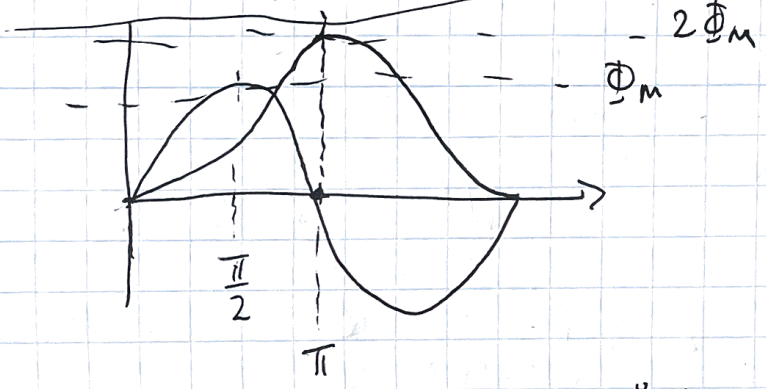
→ When an inductor is "Fully Charged" = energized → $\tau_0 = \omega t_0$ By Substitution

$$V = N\frac{\partial \Phi}{\partial t} \qquad \Phi = \frac{1}{N}\int_{\tau_0}^{\tau} V(t)\,dt = \frac{V_0}{N\omega}\left[\cos(\tau) - \cos(\tau_0)\right]$$

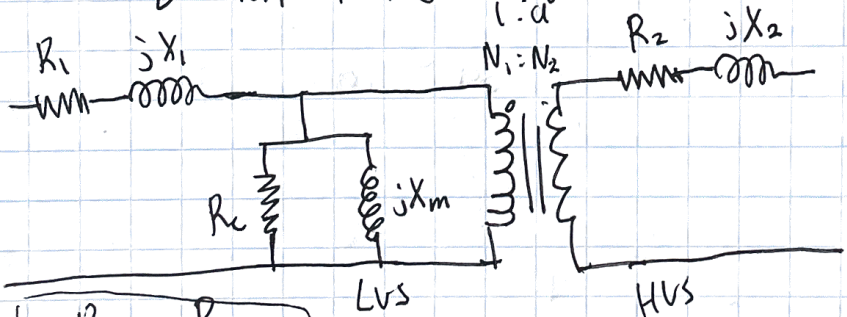
b) Inductor fully energized when the Voltage Reaches Zero

if $\tau_0 = 0$ @ π, $\Phi = 2\Phi_M$
else if $\tau_0 = \frac{\pi}{2}$, $\Phi = \Phi_M$

$$\Phi_M = \frac{V_0}{N\omega}$$



Circuit Equivalent Parameters $1:a \leftarrow \frac{N_2}{N_1}$ HVS = more turns side



$$R_1 = \frac{R_{sc}}{2a^2} \qquad R_2 = \frac{R_{sc}}{2} \qquad X_1 = \frac{X_{sc}}{2a^2} \qquad X_2 = \frac{X_{sc}}{2}$$

R_c = Calculated Above
X_m = Calculated Above.