255 : ELECTRIC POWER

NGLE PHASE TRANSFORMER

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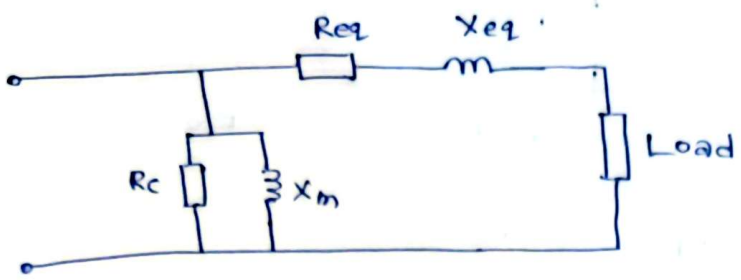
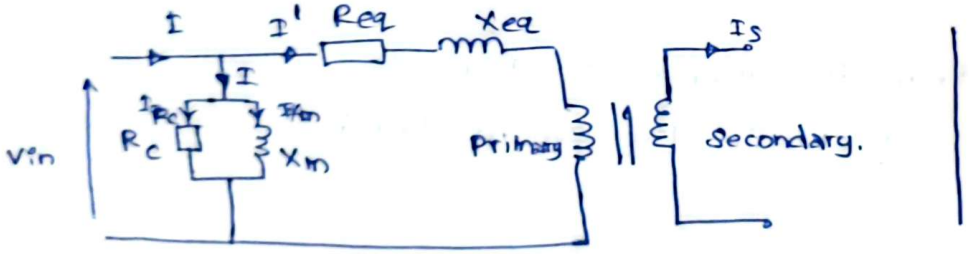


- Rc → core loss resistance. Represent losses in the core
- Xm → magnetization reactance. Represent the magnetizing current needed to establish flux in the core.
- Req → this is equivalent leakage resistance. This is because primary and secondary sides have some leakage flux in a practical transformer.
- Xeq → both flux losses in primary and secondary are transformed to the winding as Xeq.

Open circuit test is used to obtain Xm & Rc.



The secondary side is O.S.!,

$I_s = 0$

$I' = 0$

$N = \frac{V_{out}}{V_{in}}$

$P_n = \frac{V_{in}^2}{R_c}$

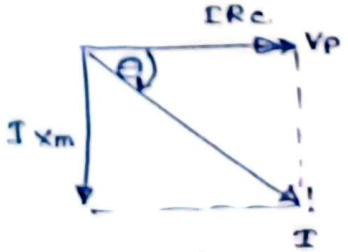
$\Phi = VI \sin\theta$

$|X_m| = I_{in} - I_{Rc}$

$|X_m| = \sqrt{I_{in}^2 - I_{Rc}^2}$

$X_m = \frac{|V_{in}|}{|I_{Xm}|}$ $\quad I_{Rc} = \frac{V_{in}}{R_c}$, $R_c = \frac{V_{in}^2}{P_n}$

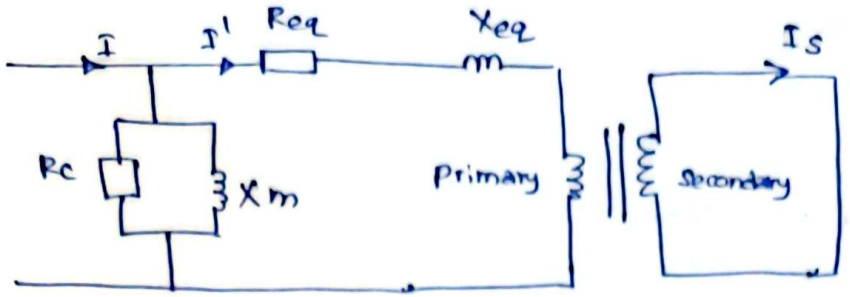
$P = VI \cos\theta$



$\theta = \cos^{-1}(P/VI)$

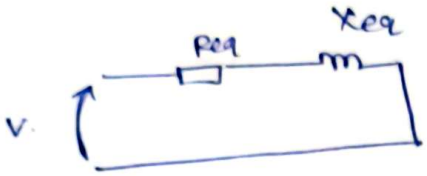
* Open circuit test is used to measure Xm and Rc.

(A)



* short circuit test used to obtain Req & Xeq

Give $\frac{1}{10} \times V_{rated}$ as the input voltage.

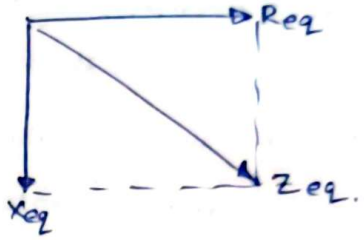


$P_{sec} = I_{sc}^2 R_{eq}$

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

$Z_{eq} = \frac{V}{I}$

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



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

$$\sqrt{P_{sc}} = \sqrt{R_{eq}} \cdot I_{sc}$$

$$\uparrow \quad \uparrow \quad \uparrow$$

$$y = m \cdot x$$

from the gradient of graph of $\sqrt{P_{sc}}$ Vs I_{sc}, R_{eq} can be found.