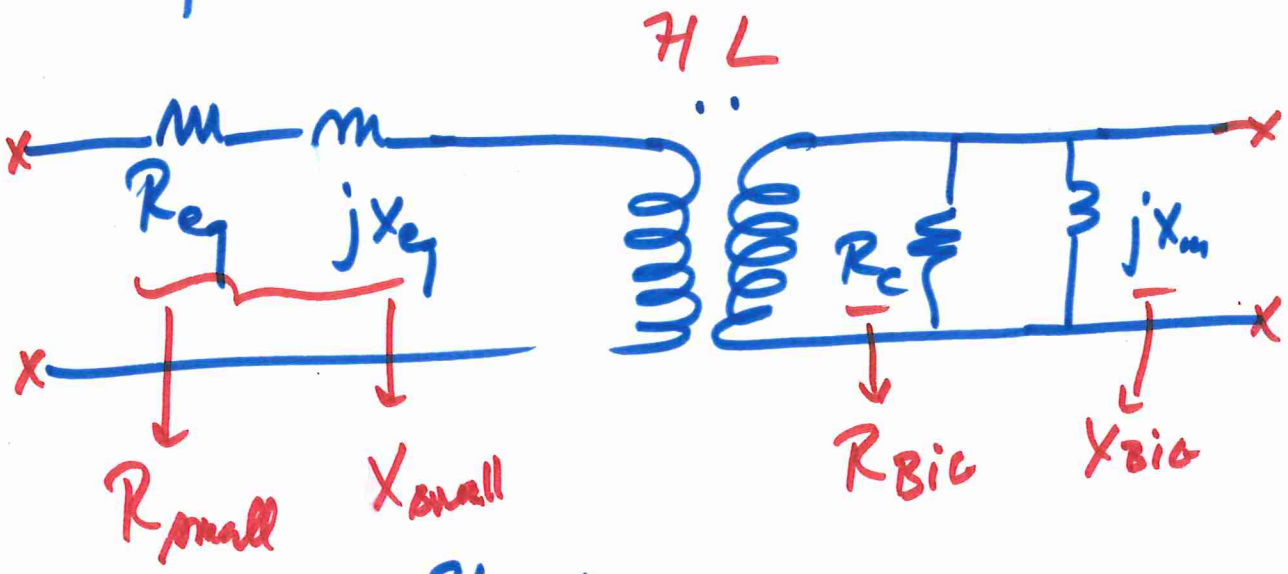
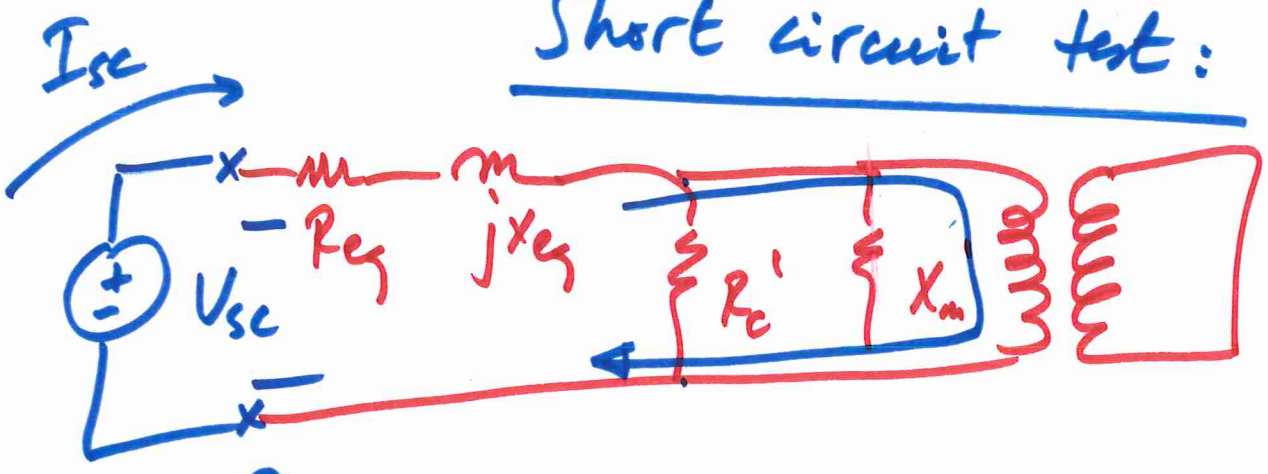
Transformers:



Short circuit test:



P_{sc}

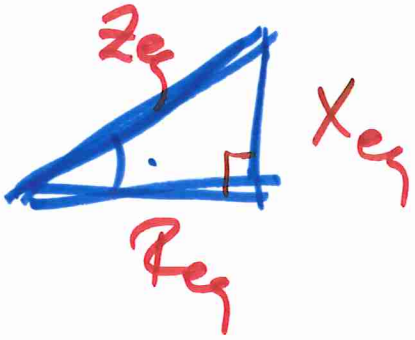
$$P_{sc} = R_{eq} I_{sc}^2$$

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

$$Z_{eq} = R_{eq} + jX_{eq} = \frac{V_{sc}}{I_{sc}}.$$

METHOD 1

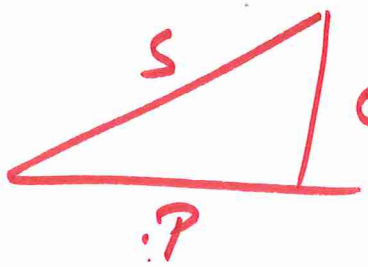
$$X_{eq} = \sqrt{Z_{eq}^2 - R_{eq}^2}$$



METHOD 2

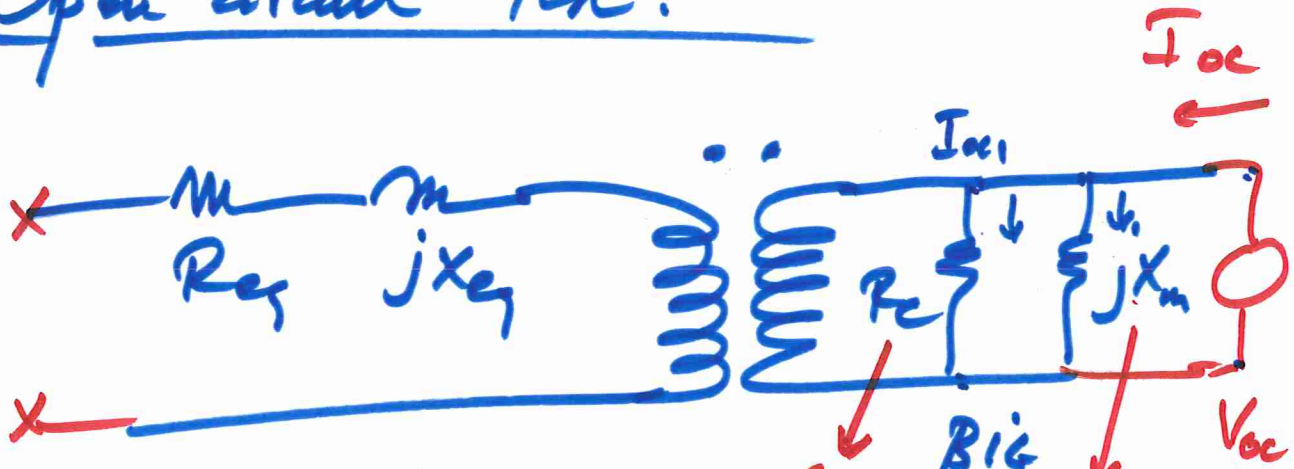
$$\cos\theta = \frac{P_{sc}}{S_{sc}} = \frac{P_{sc}}{V_{sc} I_{sc}}.$$

$$\theta = \cos^{-1}\left(\frac{P_{sc}}{V_{sc} I_{sc}}\right).$$



$$X_{eq} = R_{eq} \tan(\theta) = R_{eq} \tan\left(\cos^{-1}\left(\frac{P_{sc}}{V_{sc} I_{sc}}\right)\right)$$

Open circuit test:



admittance $Y = G_c - jB_m$ · I_{oc}

G_c ↳ Conductance

$-jB_m$ ↳ susceptance.

$$Y = \frac{I_{oc}}{V_{oc}}$$

$$Y = G_c - jB_m.$$

(3)

$$G_c = \frac{P_{oc}}{V_{oc}^2}$$

$$P_{oc} = R_c \cdot I_{oc_1}^2$$

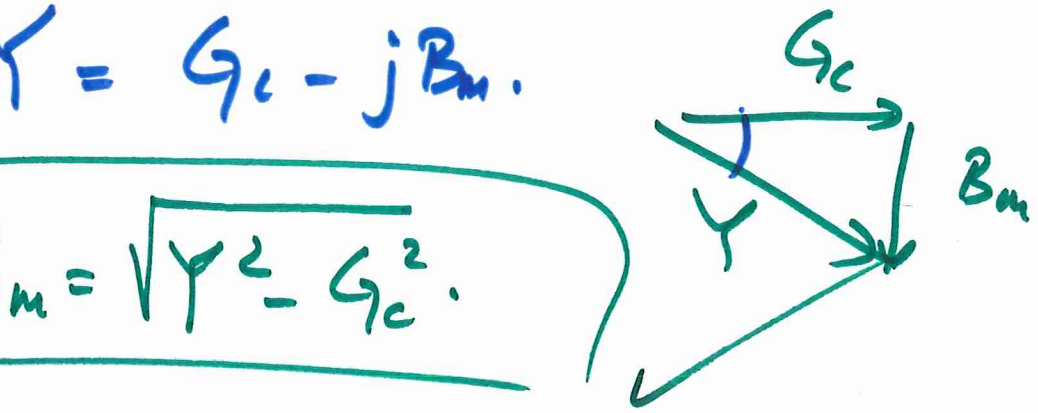
$$P_{oc} = R_c \cdot \left(\frac{V_{oc}}{R_c}\right)^2$$

$$P_{oc} = \frac{V_{oc}^2}{R_c} = V_{oc}^2 \cdot G_c$$

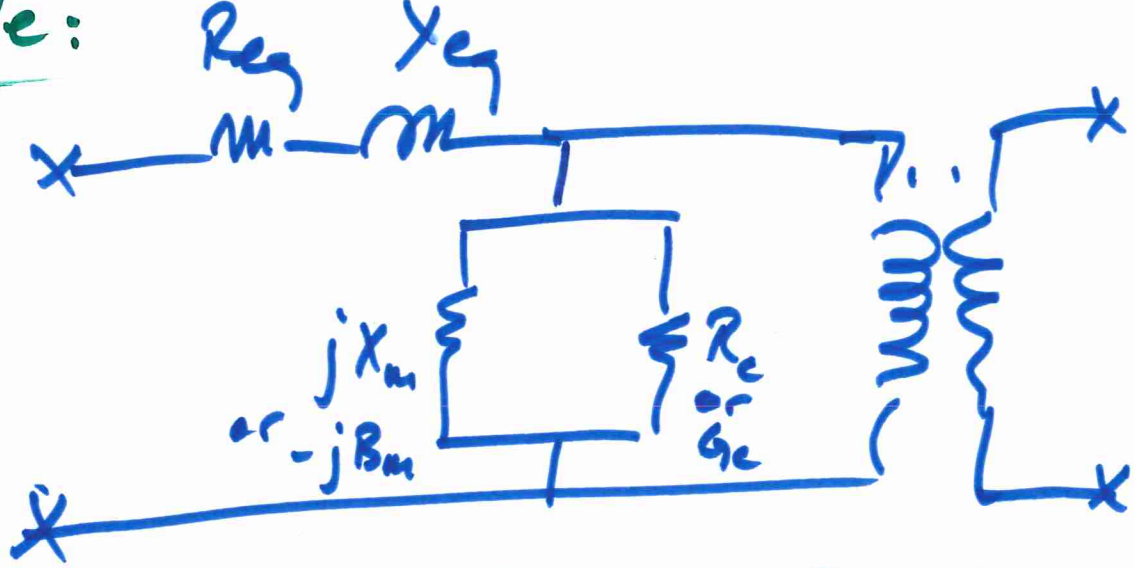
$$Y = G_c - jB_m$$

Unit Siemens Ω^{-1}

$$B_m = \sqrt{Y^2 - G_c^2}$$



Example:



SC, $I_{sc} = 91A$, $P_{sc} = 71.2\ kW$, $V_{sc} = 9.86\ kV$

OC, $I_{oc} = 5.48A$, $P_{oc} = 52.3\ kW$, $V_{oc} = 22\ kV$

Find R_{eq}, X_{eq}, R_c, X_m.