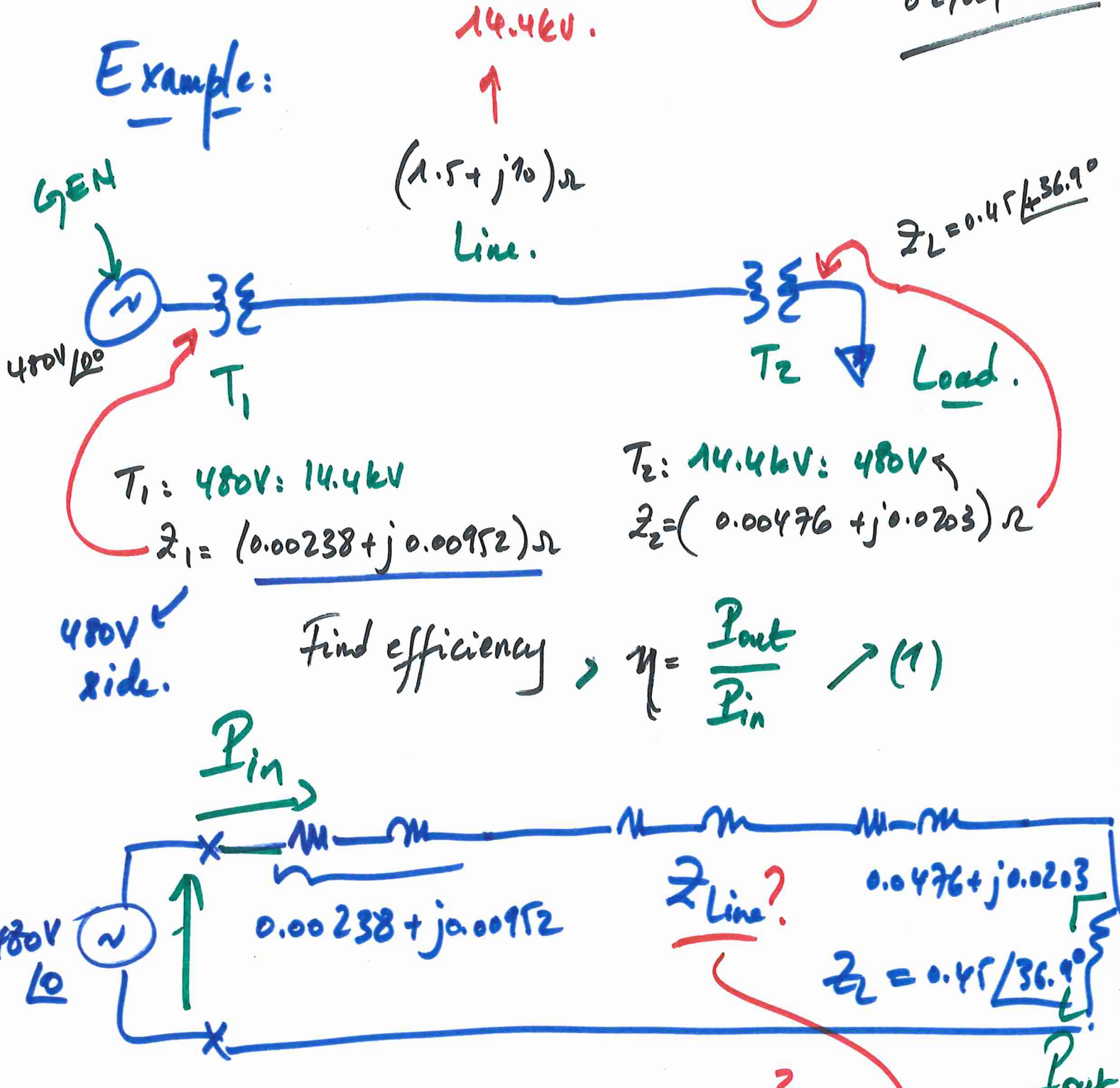
02/02/24.

Example:



$$Z_{Line} = (1.5+j10)\cdot\left(\frac{480}{14400}\right)^2 = (1.67\cdot10^{-3} + j0.011)\,\Omega$$

$$V_L = (480\angle 0^\circ)\left(\frac{Z_{load}}{Z_1 + Z_{line} + Z_2 + Z_{load}}\right)$$

$$Z_{load} = 0.45\angle 36.9^\circ$$

$$V_L = (447.1 - j\,25.4) \quad [V].$$

$$P_{out} = Re\left(\frac{|\bar{V}_L|^2}{\bar{Z}_{load}}\right)$$

$$P_{out} = 356.4\,W.$$

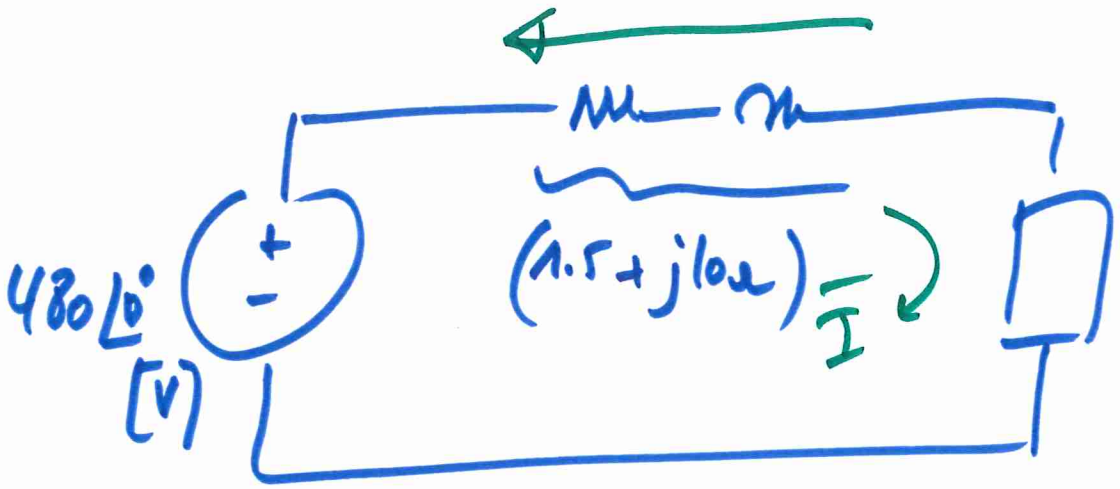
$$P_{in} = Re\{\bar{V}_{source}\,\bar{I}^*\}.$$

$$\bar{I} = \frac{480\angle 0^\circ}{Z_1 + Z_{line} + Z_2 + Z_{load}} = (760.6 - j\,641.7) \quad [A]$$

$$P_{in} = 365.1\,W$$

(3).

$$\eta = \frac{P_{out}}{P_{in}} = \underline{0.976.}$$



$$V_{out} = V_s \cdot \frac{Z_{Load}}{Z_{Load} + Z_{Line}} = \underline{(15.2 - j14.1)V}$$

$$P_{out} = Re\left(\frac{|V_0|^2}{Z_{Load}^*}\right) = \underline{761.1W} \rightarrow \text{Check!}$$

$$P_{in} = Re\left(\bar{V}_s \bar{I}^*\right) = Re\left(\bar{V}_s \left(\frac{\bar{V}_{Load}}{\bar{Z}_{Load}}\right)^*\right)$$

$\hookrightarrow (8.2 - j4\Gamma.3)$ ↑

$$P_{in} = 3.93\,kW$$

$$\eta = \frac{P_{out}}{P_{in}} = \underline{0.193}$$

Example: Operating at its rated S

Transformer 500 kVA.

2400 : 480 V

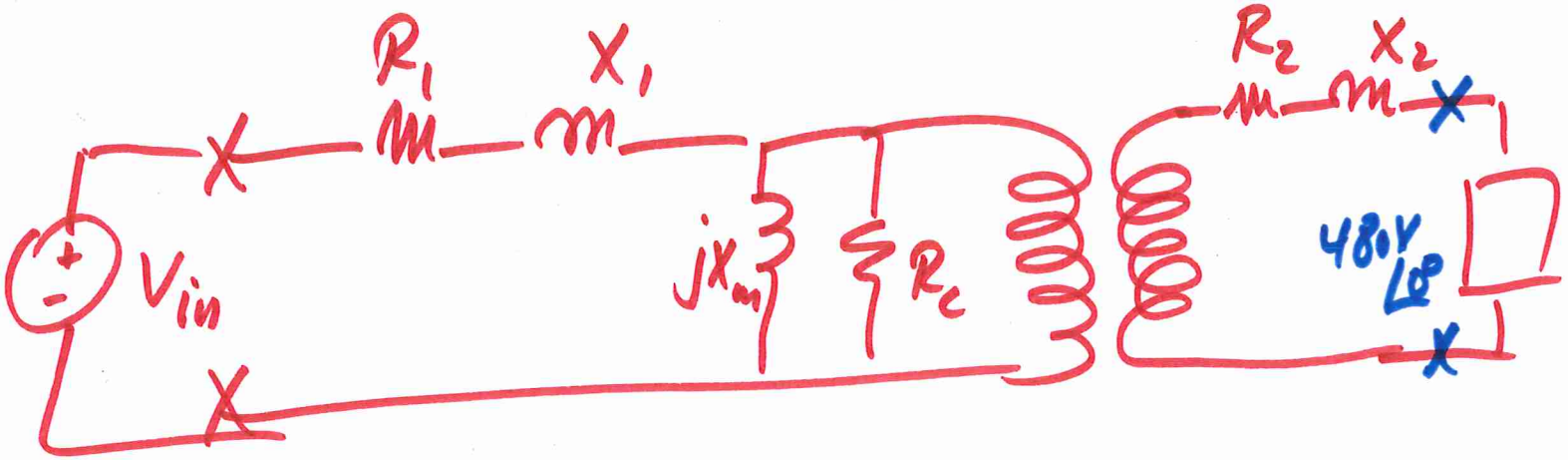
60 Hz.

$R_1 = 0.078\,\Omega$, $R_2 = 0.002\,\Omega$.

$X_1 = 0.29\,\Omega$, $X_2 = 0.012\,\Omega$. → "one"

$R_c = 200\,\Omega$, $X_m = 40\,\Omega$.

$V_{out} = 480\,V$, $pf_{out} = 0.866$ Lagging.



Find V_{in}, Pf_{in}, η → Efficiency