Ex:

Given $\omega = 300 \text{rad/s}$ and $N_1/N_2 = 10$, find the value of $C$ that makes $z_{\Delta} = 1.5 \Omega$. Note that $z_{\Delta}$ is the equivalent impedance of the entire circuit.
sol'n:

For an ideal transformer, the reflected impedance is

\[ z_r = \left( \frac{N_1}{N_2} \right)^2 z_{L_2} = 10^2 \cdot z_L \]

where \( z_L = \text{load on secondary} = \frac{1}{j\omega C} \).

We replace the entire transformer and load impedance with the reflected impedance, \( z_r \):

\[ \begin{align*}
N_1 \cdot z_L &= 100 \cdot \frac{j}{300 \cdot 3} = -j \cdot \frac{1}{3C} \\
N_2 \cdot z_r &= \frac{N_1}{N_2} \cdot z_r
\end{align*} \]

Now we have \( z_{L_2} = j4 \Omega - j \frac{1}{3C} + 1.5 \Omega \).

We want \( z_{L_2} = 1.5 \Omega \).

Thus, \( j4 \Omega - j \frac{1}{3C} = 0 \Omega \).

or \( j \frac{1}{3C} = j4 \Omega \)

or \( 3C = \frac{1}{4} \)

or \( C = \frac{1}{12} \text{ F} = 83.3 \text{ mF} \).