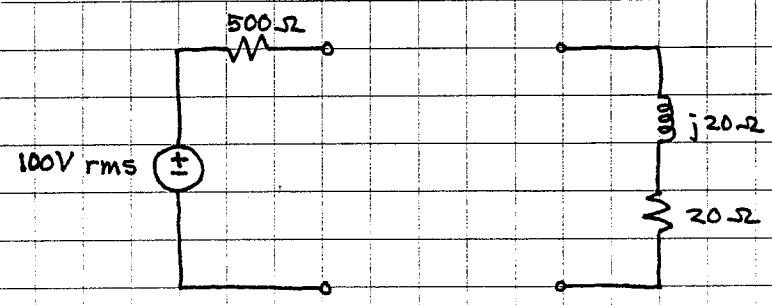
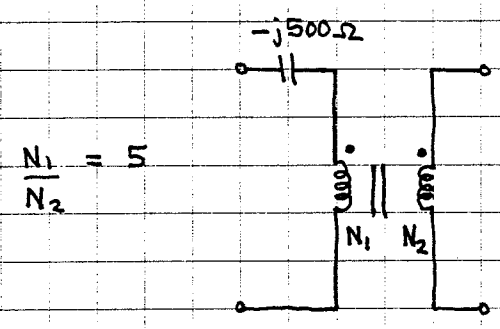



Use ideal transformer and inductance or capacitance to achieve max power absorption.

---

ans:




$\frac{N_1}{N_2} = 5$

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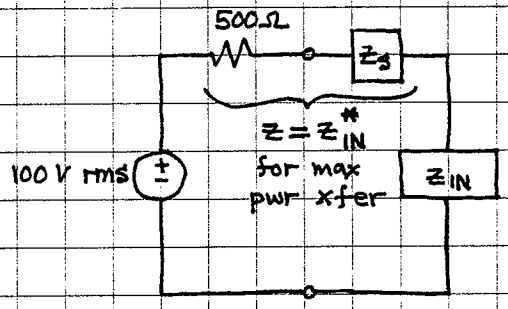
soln: For an ideal transformer, the secondary impedance reflected into the primary is $Z_{IN} = \left(\frac{N_1}{N_2}\right)^2 Z_L$.

Here, $Z_L = 20 + j20\,\Omega$.

To maximize power absorption, we want the series impedance in the primary to equal the complex conjugate of the reflected impedance:




See p. 512 of Text for max pwr xfer discussion.

$$Z_{IN}^* = \left(\frac{N_1}{N_2}\right)^2 (20 + j20)^*\,\Omega$$

$$= \left(\frac{N_1}{N_2}\right)^2 20 - j\left(\frac{N_1}{N_2}\right)^2 20\,\Omega$$

Since $Z_s$ was specified to be an inductance or capacitance we must have $500\,\Omega = \left(\frac{N_1}{N_2}\right)^2 \cdot 20\,\Omega = \mathrm{Re}[Z_{IN}^*]$. $\therefore \frac{N_1}{N_2} = 5$

To match $j\,\mathrm{Im}[Z_{IN}^*] = -j\,5^2 \cdot 20\,\Omega = -j500\,\Omega$ use $Z_s = -j500\,\Omega$ capacitor.