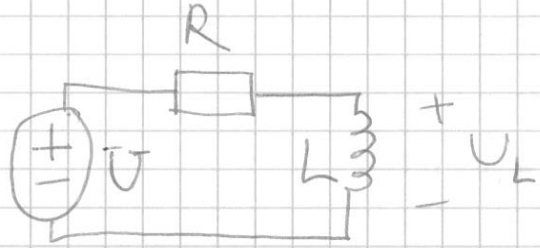
AC 1



$U = 10\ V$

$R = 100\ \Omega$

$L = 0{,}050\ H$

$\omega = 2000\ rad/s$

Komplexa spänningen:

$$U_L = U \cdot \frac{j\omega L}{R + j\omega L} = 10 \cdot \frac{j2000 \cdot 0{,}05}{100 + j2000 \cdot 0{,}05} =$$

$$= 10 \cdot \frac{j100}{100 + j100} = 10 \cdot \frac{j}{1 + j} =$$

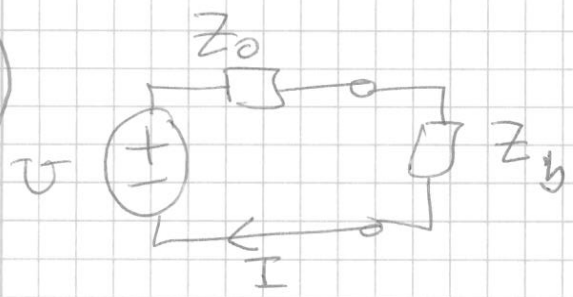
$$= \frac{10 \cdot e^{j90^\circ}}{\sqrt{2} \cdot e^{j45^\circ}} \approx 7{,}07 \cdot e^{j45^\circ}$$

Tidsfunktion:

$$u_L(t) = Im(U_L \cdot e^{j\omega t}) = 7{,}07 \cdot \sin(\omega t + 45^\circ)$$

$$\approx 7{,}1 \cdot \sin(2000t + 45^\circ) \quad volt$$

AC4



$Z_0 = 50 - j20\ \Omega$

$U = 5\ V$

$\omega = 5000\ rad/s$

a) $Z_b = Z_0^* = \underline{50 + j20\ \Omega}$

$\Rightarrow$ totala impedansen i kretsen blir

$Z_{tot} = Z_0 + Z_b = 100\ \Omega$

$$I = \frac{U}{Z_{tot}} = 0{,}05\ A$$

$$\boxed{P_b = \frac{1}{2}|I|^2 \mathrm{Re}\{Z_b\}}$$

$$P_b = I^2 \cdot \mathrm{Re}\{Z_b\} \cdot \frac{1}{2} = 0{,}05^2 \cdot 50 \cdot \frac{1}{2} = \underline{0{,}0625\ W}$$

↑ i detta fall är strömmen reell

$\approx \underline{0{,}062\ W}$

b) $Z_b = |Z_0| = \sqrt{50^2 + (-20)^2} \approx 53{,}85\ \Omega$

$\approx \underline{54\ \Omega}$

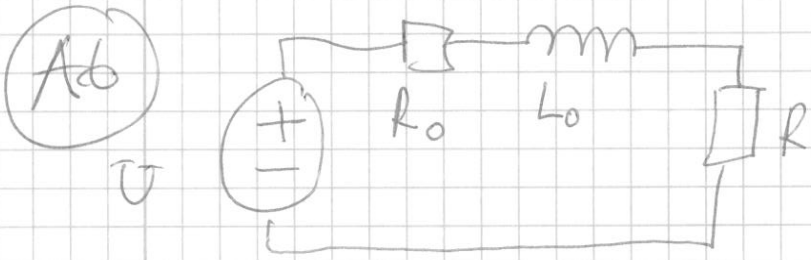
Z_b reell

$$P_b = Z_b \cdot |I|^2 \frac{1}{2}$$

$$|I| = \left|\frac{U}{Z_{tot}}\right| = \frac{5}{|50 - j20 + 53{,}85|} \approx 0{,}0473$$

$\Rightarrow P_b \approx 0{,}0602 \approx \underline{0{,}06\ W}$

A6



$U = 15\,V$

$R_0 = 18\,\Omega$

$L_0 = 35 \cdot 10^{-3}\,H$

$\omega = 300\ rad/s$

Se R som belastning och R_0, L_0 som "impedans för källan".

Max. effekt i R om:

$$R = |R_0 + j\omega L_0| = \sqrt{18^2 + (300 \cdot 35 \cdot 10^{-3})^2}$$

$$\simeq 20{,}84\,\Omega \simeq \underline{\underline{21\,\Omega}}$$

$$P = \frac{1}{2}|I|^2 \cdot R = \frac{1}{2}\left|\frac{U}{Z_{tot}}\right|^2 \cdot R =$$

$$= \frac{1}{2}\left|\frac{15}{18 + j300 \cdot 35 \cdot 10^{-3} + 20{,}84}\right|^2 \cdot 20{,}84 \simeq \underline{\underline{1{,}45\ W}}$$