

a)  $Z_{ie} = ? \quad X_1 = \omega L_1 = 2\pi f \cdot L_1 = 2\pi \cdot 275 \text{ Hz} \cdot 100 \text{ mH} = (172,8) \approx 173 \Omega$

$X_2 = \omega L_2 = 2\pi f L_2 = 431,9 \approx 432 \Omega$

$\Rightarrow Z_1 = 10 \Omega + j 173 \Omega$

$\Rightarrow Z_2 = 25 \Omega + j 432 \Omega$

$$Z_{ie} = \left( \left( \left( R_{1, \text{gen}} \oplus R_1 \right) \parallel R_2 \right) \oplus Z_1 \right) \parallel R_3 \oplus Z_2 = \left( Z_1 \parallel R_3 \right) \oplus Z_2 \approx 155 \Omega + j 580 \Omega$$

$\frac{50 \Omega + 330 \Omega = 380 \Omega}{380 \Omega \parallel 220 \Omega = 138 \frac{1}{3} \Omega}$ 
 $\frac{10 \Omega + 330 \Omega = 340 \Omega}{340 \Omega \parallel 220 \Omega = 138 \frac{1}{3} \Omega}$ 
 $\frac{138 \frac{1}{3} \Omega + 10 \Omega + j 173 \Omega = 148 \frac{1}{3} \Omega + j 173 \Omega}{= Z_1}$ 
 $\frac{129,9 \Omega + 147,5 \Omega \approx 277,4 \Omega}{\approx 155 \Omega + j 580 \Omega}$

$\Rightarrow R_{ie} = 155 \Omega$

$\Rightarrow X_{ie} = 580 \Omega$

$|Z_{ie}| = \sqrt{R_{ie}^2 + X_{ie}^2} = \sqrt{(155 \Omega)^2 + (580 \Omega)^2} \approx 600 \Omega$

b)  $R_a = |Z_{ie}| = 600 \Omega$

$P_a = \frac{U_a^2}{2(R_i + R_a)} = \frac{(2V)^2}{2(155 \Omega + 600 \Omega)} = 2,65 \text{ mW}$

c)  $P_{a, \text{max}} = \frac{U_a^2}{4R_i} = \frac{4V^2}{4 \cdot (155 \Omega)} = 6,45 \text{ mW}$

d)  $R_{ie} = \left( \left( \frac{U_L}{U_a} \right)^2 R_a^2 - R_a^2 - \left( \frac{U_L}{I_k} \right)^2 \right) \cdot \frac{1}{2 \cdot R_a}$

①

$U_{L, \text{mV}}$	622
$I_{k, \text{mA}}$	1,06

$R_a = 500 \Omega \Rightarrow U_a = 356 \text{ mV}$

$R_{ie} = \left[ \left( \frac{U_L}{U_a} \right)^2 R_a^2 - R_a^2 - \left( \frac{U_L}{I_k} \right)^2 \right] \cdot \frac{1}{2 R_a} = \left[ \left( \frac{622 \text{ mV}}{356 \text{ mV}} \right)^2 \cdot 500 \Omega^2 - 500 \Omega^2 - \left( \frac{622 \text{ mV}}{1,06 \text{ mA}} \right)^2 \right] \cdot \frac{1}{2 \cdot 500 \Omega}$

$R_{ie} = 187 \Omega \checkmark$

$Z_{ie} = \frac{U_L}{I_k} = \frac{622 \text{ mV}}{1,06 \text{ mA}} = 586 \Omega \checkmark$

$\Rightarrow X_{ie} = \sqrt{Z_{ie}^2 - R_{ie}^2} = \sqrt{(586 \Omega)^2 - (187 \Omega)^2} = 555 \Omega$

$X_{ie} = 555 \Omega \checkmark$

Gemessene Werte werden aufgrund der Bauteiltoleranzen und Messungenauigkeit ab!

