Elektronik

Aufgabe 4

Lampe
$u = 12V$
$P = 20W$
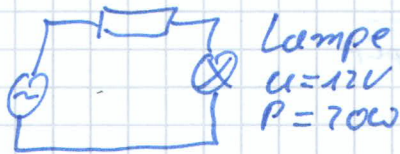
$$I = \frac{P}{u} = \frac{20}{12} = \frac{5}{3} A$$

$$R = \frac{u}{I} = 7,2 \Omega$$

$$P_R = u \cdot I = 12V \cdot \frac{5}{3} A = 20W$$

b)

$Z = R + i\omega L$

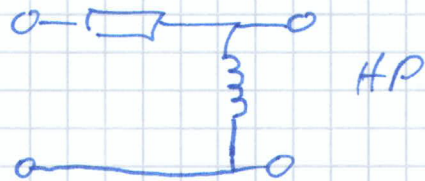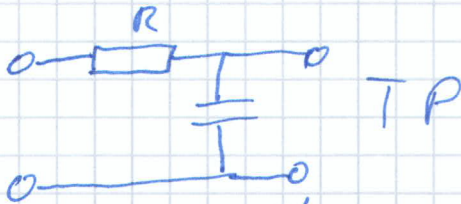$$|Z| = \sqrt{R^2 + (i\omega L)^2} = 14,4 \Omega$$

$$\Box Z^2 = R^2 + \omega^2 L^2 \iff L = \sqrt{\frac{Z^2 - R^2}{\omega^2}}$$

$$= 39,7 \, mH$$

Blindleistung: $P_B \overset{*}{=} Im(P) = \omega L I^2 = 2\pi f I^2 = 34,8 W$

Wirkleistung: $P_w = Re(P) = R I^2 = 20,1 W$

$*$ $Im(z) I^2$

Aufgabe 5

 TP

 HP

b) $\ddot{U}(\omega) = \frac{|U_a|}{|U_e|}$

TP: $\ddot{U}(\omega) = \left| \frac{U_a(\omega)}{U_e(\omega)} \right| = \frac{1}{\sqrt{1 + \omega^2 C^2 R^2}}$

HP: $\ddot{U}(\omega) = \frac{|i\omega L|}{|R + i\omega L|} = \frac{1}{\sqrt{1 + \frac{R^2}{\omega^2 L^2}}}$

c) $\omega_{GR} = \frac{1}{RC} \Rightarrow C = \frac{1}{R\omega_G} = \frac{1}{2\pi f_r R}$

HP: $\omega_{GR} = \frac{R}{L} \Rightarrow L = \frac{R}{2\pi f_r} = 2,387 \, mH$

Aufgabe 6)

$f = 2,5 \text{ MHz}$

$\omega = 5\pi \text{ MHz}$

$R = 1 \text{ k}\Omega$

$C = 10 \text{ pF}$

$Z_R = R + \dfrac{1}{i\omega c}$ $\quad |z|$

$Z_P^{-1} = \dfrac{1}{R_p} + i\omega c_p$

$Z_P = \dfrac{R_p}{1 + i\omega R_p C_p}$

$$\Rightarrow \frac{i\omega C_R R_R + 1}{i\omega C R} = \frac{R_p}{1 + i\omega C_p R_p} \qquad \Rightarrow R_R = \frac{R_p}{1 + \omega^2 R_p^2 C_p^2}$$

$$-\frac{1}{C_R C_R} = \frac{-R_p^2 \omega C_p}{1 + \omega^2 R_p^2 C_p^2}$$

$$C_p = \frac{1}{2\pi f X_R} = 0,4 \text{ nF} \qquad\qquad R_p = 41,5 \text{ k}\Omega$$