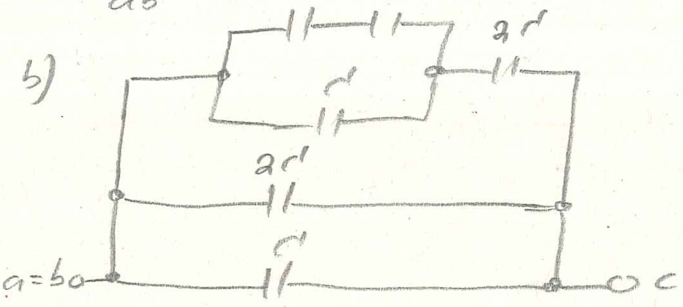
(1)

a) $C_{ab} = 0$

b)



$C_{ac} = 4C$

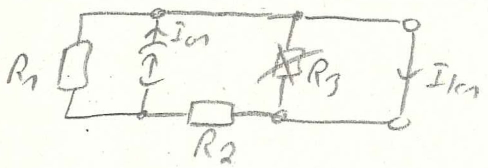
c)
$C_{bc} = C_{ac} = 4C$

---

d) $R_i = \dfrac{(R_1 + R_2) \cdot R_3}{R_1 + R_2 + R_3}$

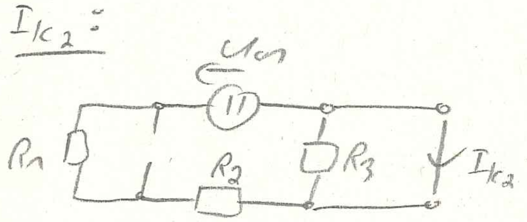
e) $I_k = I_{k1} + I_{k2}$

I_{k1}:



$I_{k1} = I_{01} \cdot \dfrac{R_1}{R_1 + R_2}$

I_{k2}:

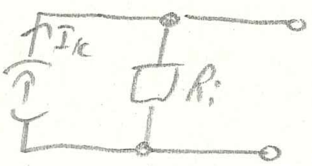


$I_{k2} = \dfrac{U_{01}}{R_1 + R_2}$

$\Rightarrow I_k = I_{k1} + I_{k2} = \dfrac{I_{01} \cdot R_1 + U_{01}}{R_1 + R_2}$

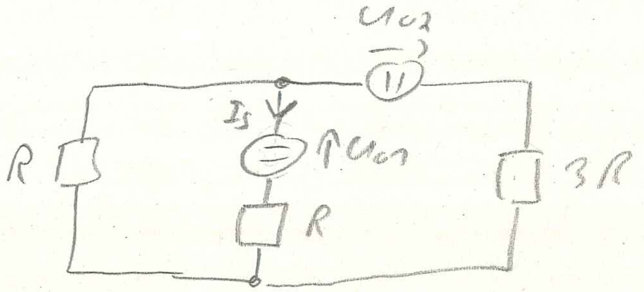
f) $U_L = \dfrac{(I_{01} \cdot R_1 + U_{01}) \cdot R_3}{R_1 + R_2 + R_3}$

g)



2.

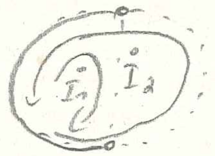
a)



$U_{01} = I_{01} \cdot R_i$

$U_{02} = I_{02} \cdot R_i$

b)



--- Zweig

— Baum

c) $m = z - (k-1) = 2$

d)

$$\begin{pmatrix} 2R & -R \\ -R & 4R \end{pmatrix} \begin{pmatrix} \mathring{I}_1 \\ \mathring{I}_2 \end{pmatrix} = \begin{pmatrix} U_{01} \\ U_{02} \end{pmatrix}$$

e) $I_S = \mathring{I}_1$!

$$2R \cdot \mathring{I}_1 - R \cdot \mathring{I}_2 = U_{01}$$

$$-R \cdot \mathring{I}_1 + 4R \cdot \mathring{I}_2 = U_{02}$$

I: $\mathring{I}_2 = -\dfrac{U_{01} - 2R\mathring{I}_1}{R}$

in II: $-R \cdot \mathring{I}_1 - 4\cancel{R} \cdot \dfrac{U_{01} - 2R\mathring{I}_1}{\cancel{R}} = U_{02}$

$\Leftrightarrow \quad -R \cdot \mathring{I}_1 + 8R\mathring{I}_1 = U_{02} + 4U_{01}$

$\Leftrightarrow \quad \mathring{I}_1 = \dfrac{U_{02} + 4U_{01}}{7R}$

$$\boxed{\begin{aligned} U_{01} &= 5V \\ U_{02} &= 1V \\ R &= 40\Omega \end{aligned}}$$

$\Rightarrow \mathring{I}_1 = \dfrac{1V + 20V}{7 \cdot 40\Omega} = \dfrac{\cancel{21}^{3} V}{\cancel{7} \cdot 40\Omega} = 0{,}075\,A$

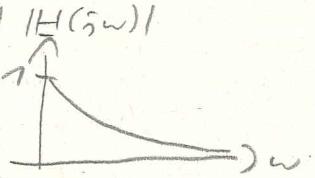
$\underline{\underline{I_S = \mathring{I}_1 = 75\,mA}}$

3.

a) $\underline{H}(j\omega) = \dfrac{\underline{U}_2(j\omega)}{\underline{U}_1(j\omega)} = \dfrac{1}{1+j\omega\frac{L}{R}}$

b) $|\underline{H}(j\omega)| = \dfrac{1}{\sqrt{1+(\omega\frac{L}{R})^2}}$

c) $\underline{\omega=0:}$ $|\underline{H}(j\omega=0)| = 1$; $\underline{\omega\to\infty:}$ $|\underline{H}(j\omega\to\infty)| = 0$

d) 

e) Tiefpass

f) $\underline{H}_L(j\omega) = \dfrac{\underline{U}_2(j\omega)}{\underline{U}_1(j\omega)} = \dfrac{\underline{U}_2(j\omega)}{\underline{U}_3(j\omega)} \cdot \dfrac{\underline{U}_3(j\omega)}{\underline{U}_1(j\omega)} = \dfrac{R}{R+\frac{1}{j\omega C}} \cdot \dfrac{R//(R+\frac{1}{j\omega C})}{j\omega L + (R//(R+\frac{1}{j\omega C}))}$

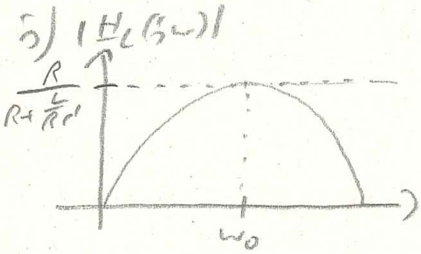
$$= \frac{R}{R+\frac{L}{RC} + j\left(\omega 2L - \frac{1}{\omega C}\right)}$$

g) $|\underline{H}_L(j\omega)| = \dfrac{R}{\sqrt{(R+\frac{L}{RC})^2 + (\omega 2L - \frac{1}{\omega C})^2}}$

h) $\underline{\omega=0:}$ $|\underline{H}_L(j\omega=0)| = 0$; $\underline{\omega\to\infty:}$ $|\underline{H}_L(j\omega\to\infty)| = 0$

i) $\omega_0 2L \overset{!}{=} \dfrac{1}{\omega_0 C}$ Betrag wird maximal, wenn $Im = 0$!

$\Rightarrow \omega_0 = \dfrac{1}{\sqrt{2LC}}$; $|\underline{H}_L(j\omega_0)| = \dfrac{R}{R+\frac{L}{RC}}$

j) 

k) Bandpass
Durch den Lastwiderstand R_L hat die Kapazität einen Einfluss!

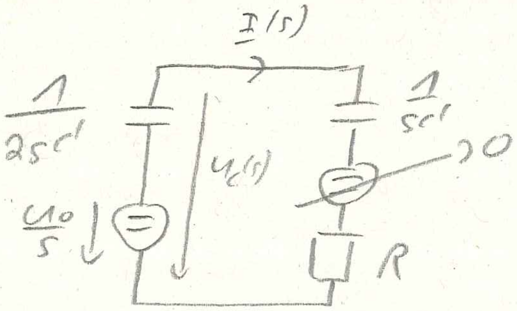
4.

5517

a) $u_C(t=0+) = u_C(t=0-) = U_0$

b) $i(t) = 0 \quad ; t<0$

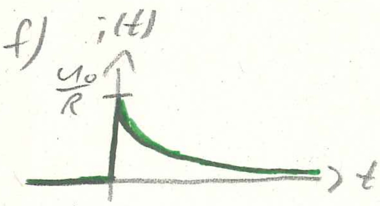
c)



d) $$I(s) = \frac{\frac{U_0}{s}}{\frac{1}{s2C} + \frac{1}{sC} + R} = \frac{U_0}{R} \cdot \frac{1}{s + \frac{3}{2}\frac{1}{RC}}$$

e) $$i(t) = \frac{U_0}{R} \cdot e^{-\frac{3}{2RC}t} \quad ; t \geq 0$$

f)



g) Es dauert länger bis der Strom gegen Null absinkt.
Das Maximum bei $t=0$ ist kleiner.