2007. 10. 27. péntek — XVI. Előadás (7. hét)

Múltkori példa folyt... =]

$f_H = 2,8\ kHz \qquad a_H = -0,89 dB$

$f_S = 8\ kHz \qquad a_S = -26 dB$

$\Rightarrow \quad p_1 = -1,285$

$p_2 = -0,64265 + j\,1,113$

$p_3 = -0,64265 - j\,1,113$

$$F(p) = \frac{1}{B_0 + B_1 p + \dots B_n p^n} \rightarrow (p-p_3)(p-p_2)(p-p_1) =$$

$= p^3 + 2,256 p^2 + 3,304 p + 2,128 = \quad / : 2,128$

$= 0,471 p^3 + 1,207 p^2 + 1,5561 p + 1$

$F(p) = \frac{1}{B(p)} = \begin{cases} \Omega_H = 1 \rightarrow j1 \Rightarrow -0,87 dB \\ \Omega_S = 2,8171 \rightarrow j2,8171 \Rightarrow -20,8 dB \Rightarrow \text{norm.-ben } -26 dB\text{-nél} \end{cases}$

MATLAB:

```
>> mp = [1];
>> np = [0,471   1,287   1,556   1];
                p^3     p^2     p^1   p^0
(felvitel) >> w = 0.1 : 0,02 : 5;
(értékadás) >> [mag, phase, w] = bode (mp, np, w)
   >> plot (w, mag), grid
   >> bode (mp, np, w);
```

$$P = \frac{p}{\omega_H}$$

$$F(P) = \frac{1}{0{,}471\,P^3 + 1{,}287\,P^2 + 1{,}556\,P + 1} =$$

$$\left(\frac{p}{\omega_H}\right)^3 \qquad \left(\frac{p}{\omega_H}\right)^2 \qquad \left(\frac{p}{\omega_H}\right)$$

$$\omega_H = 2{,}8 \cdot 2\pi \cdot 10^3 = 19{,}593\ \frac{\text{krad}}{\text{sec}}$$

$$= \frac{1}{8{,}0498 \cdot 10^{-14} p^3 + 3{,}9117 \cdot 10^{-?} p^2 + 8{,}8205 \cdot 10^{-5}\, p + 1}$$

$\Rightarrow mp, np, w \Rightarrow 1000, 1000, 70000;$

printsys(mp, np) $\frac{1}{\ldots}$

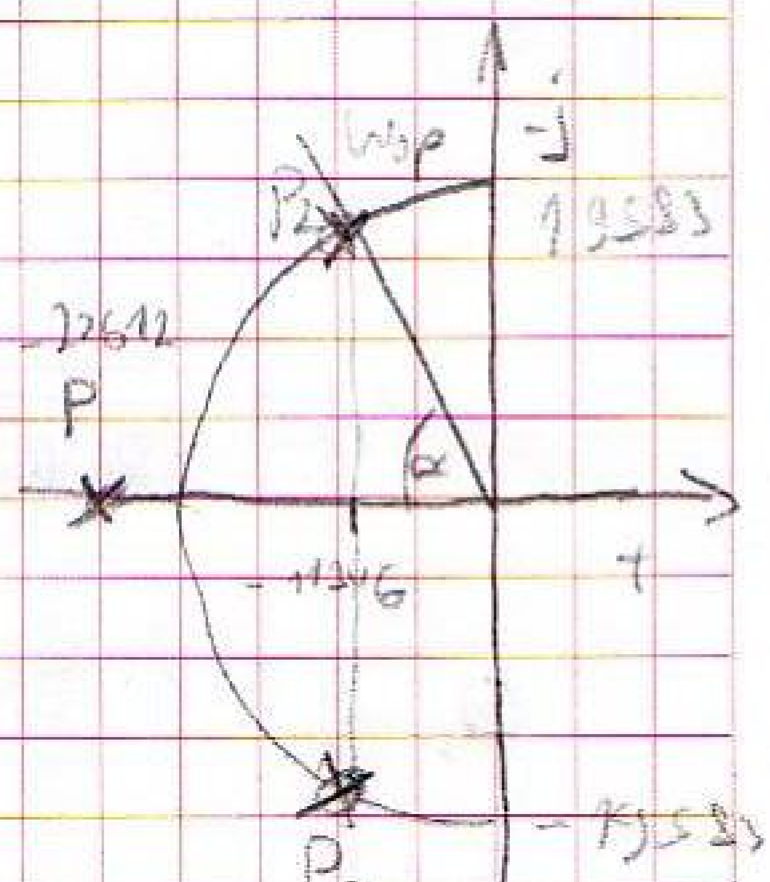
Megvalósítás

1 tárolós tag: $P_1 \Rightarrow p_1 = P_1 \cdot \omega_H$ (19593) $\Rightarrow -22612$

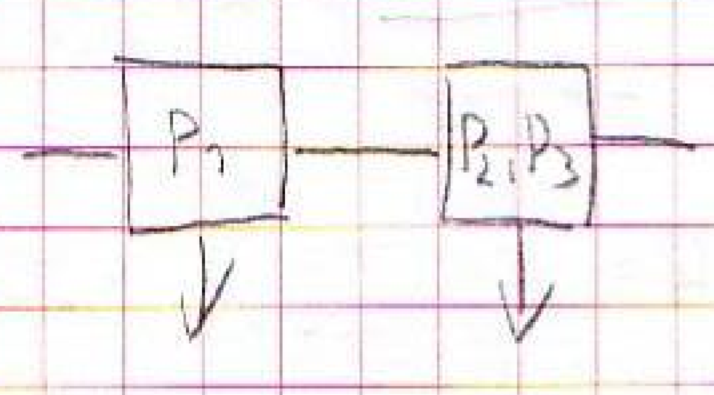
$P_2 \Rightarrow$ $\Rightarrow -11306 + j\,19583$

2 tárolós tag: $P_3 \Rightarrow$ $\Rightarrow -11306 - j\,19583$

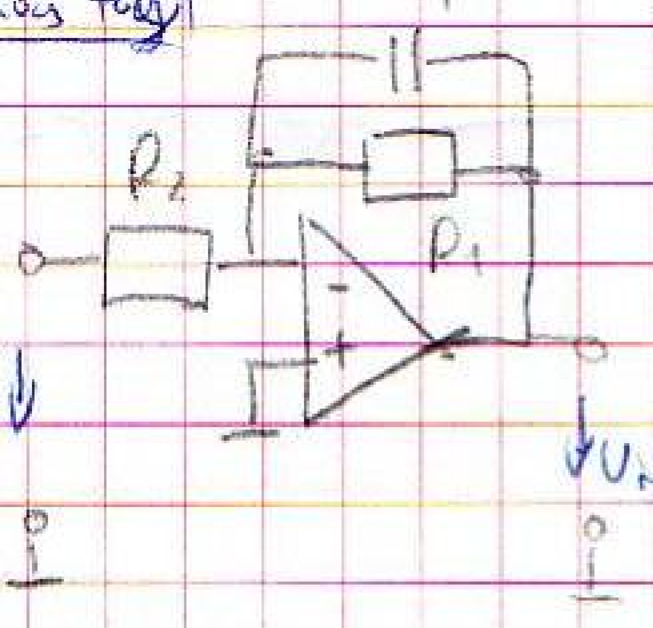
$\left\}\left(\Rightarrow \begin{matrix}\omega_{0p} \\ Q_p\end{matrix}\right)\right.$



Kaszkádosítás



1-tárolós tag



$$\omega_{0e} = \frac{1}{R_1 C_1}$$

$$A_{u0} = -\frac{R_1}{R_2}$$

$$A_{u0} = 1 \Rightarrow R_1 = R_2 = R$$

$$\Rightarrow R_1 = R_2 = R = \frac{1}{\omega_{0e} C_1} = 22{,}1\,k\Omega$$

($\omega_{0e} \rightarrow 22612$, $C_1 \rightarrow 1\,nF$)

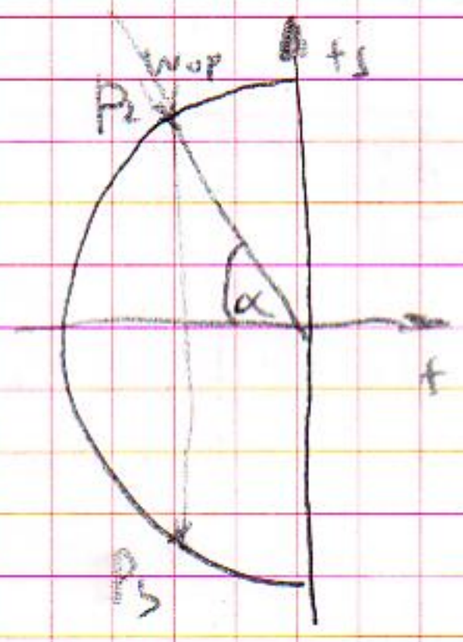
$\boxed{\Rightarrow R_1 = 22{,}1\,k\Omega,\ C_1 = 1\,nF}$

$\downarrow$

$\pm 5\%, \pm 2\%, \pm 1\%$

$\downarrow$ időbeni stabilitás jobb

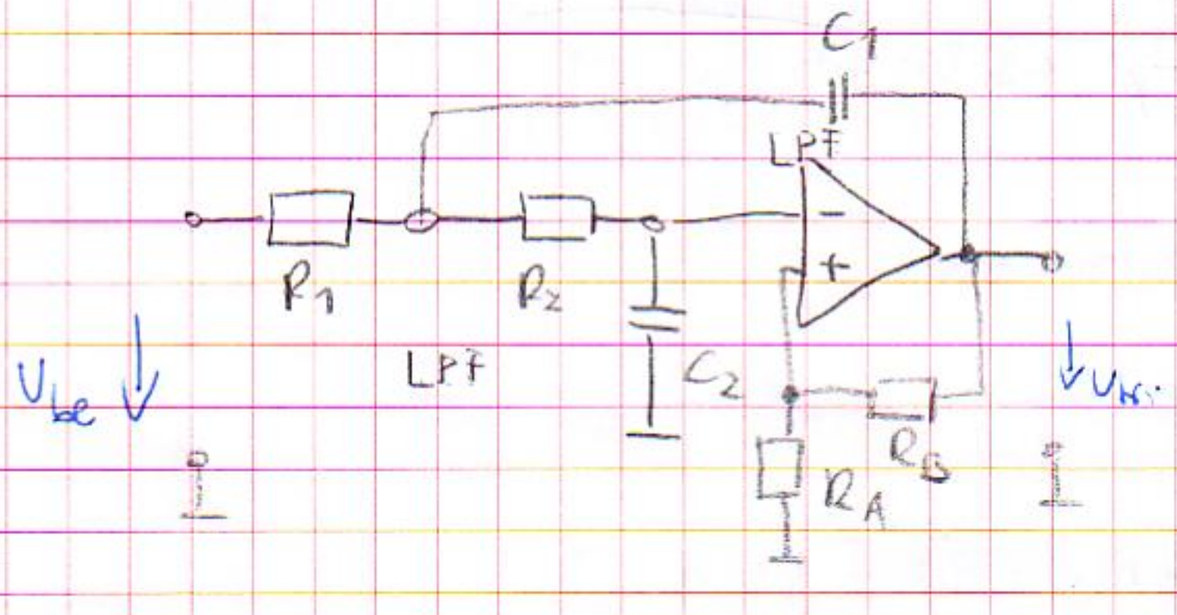
2-fokú tag számítása

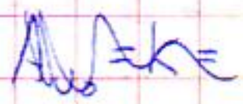


$$w_{op} = \sqrt{19583^2 + 11306^2} \Rightarrow 22612 \frac{rad}{sec}$$

$$tg\alpha = \frac{19583}{11306} = \sqrt{3} \overset{\alpha=}{\Rightarrow} 60°$$

$$Q_p = \frac{1}{2\cos\alpha} \Rightarrow \frac{1}{2 \cdot 0{,}5} = 1$$





$$A_{w_0} = K = 1$$

$$w_{p_0} = \frac{1}{\sqrt{R_1 R_2 C_1 C_2}} \Rightarrow w_0 = \frac{1}{R\sqrt{C_1 C_2}} \Rightarrow R\sqrt{C_1 C_2} = \frac{1}{w_{op} R}$$

$$\frac{1}{Q_p w_{op}} = R_1 C_1 (1-K) + (R_1 + R_2) C_2$$

$$C_1 \cdot C_2 = \left(\frac{1}{w_{op} R}\right)^2 =$$

$$\Rightarrow C_1 = \frac{1}{(22612 \cdot 20)^2} = 1nF$$

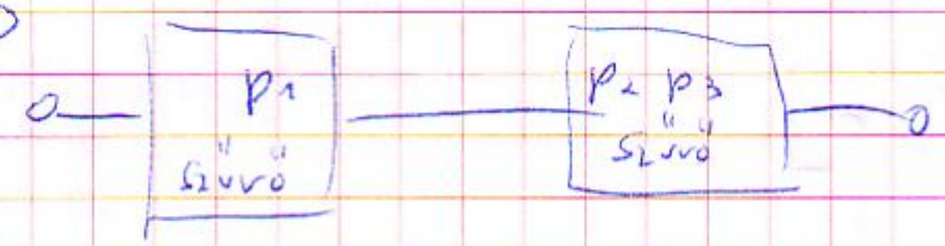
$$\Omega_p = 1$$
$$w_{op} = 22612$$
$$R_1 = R_2 = R$$

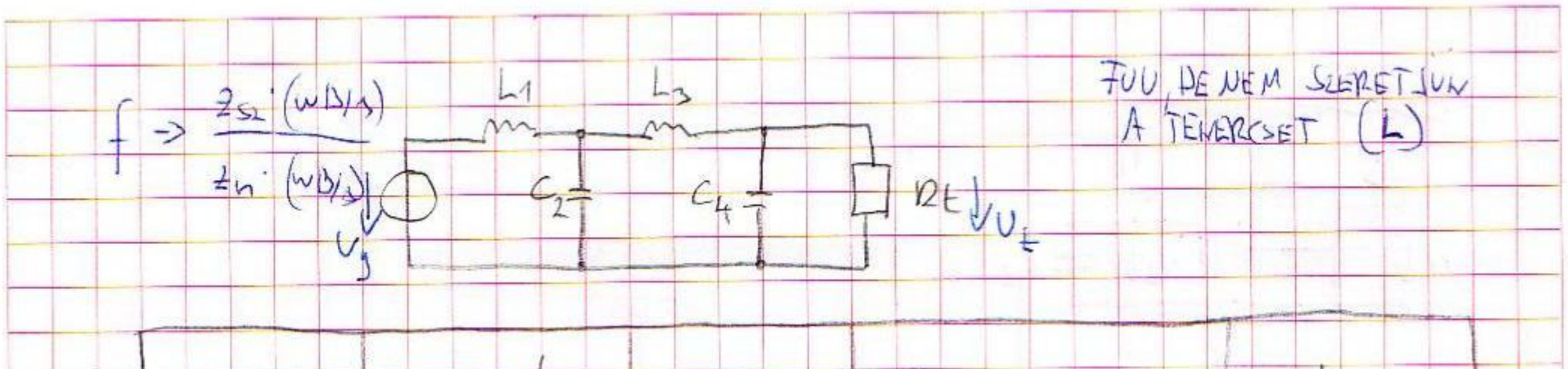
$$\Rightarrow \frac{1}{w_{op}} = (R_1 + R_2) C_2 \Rightarrow C_2 = \frac{1}{2R w_{op}} = 1nF \Rightarrow$$

$$R = \frac{1}{2 \cdot 10^{-9} \cdot 22612} = \sim 20k\Omega$$
$$22{,}1k$$

$$\boxed{C_2 = 1nF \Rightarrow R = 22{,}1k\Omega \Rightarrow C_1 = 1nF}$$

vágsó megold $\Rightarrow$

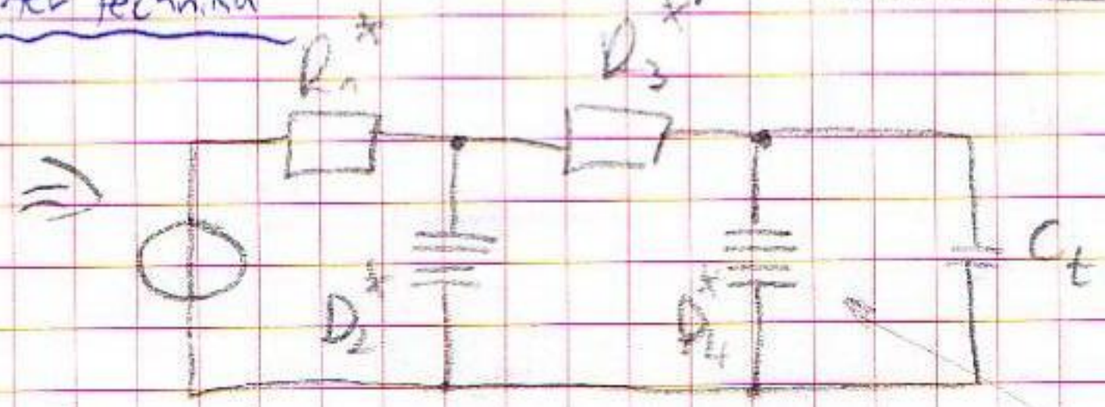




FUU, DE NEM SZERETJÜK A TEMERCSET (L)

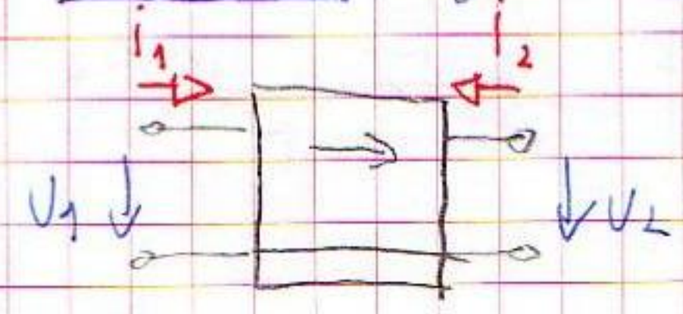
Betűjel	jelölés	Z(s)	Z(s)·wB/s	eredmény
L	—m—	sL	$sL\cdot\frac{w_B}{s}=w_B L$	$R^*=w_B\cdot L$
R	—□—	R	$R\frac{w_B}{s}=\frac{1}{s\frac{w_B}{R}}$	$C^*=\frac{w_B}{R}$
C	—||—	$\frac{1}{sC}$	$\frac{1}{sC}\cdot\frac{w_B}{s}=\frac{1}{s^2\frac{C}{w_B}}$	D^*

Konverter technika



dupla kondi LOL =]

G.I.C. (general impedance converter)

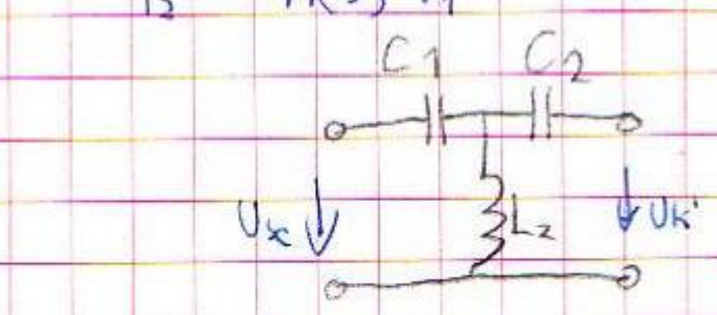


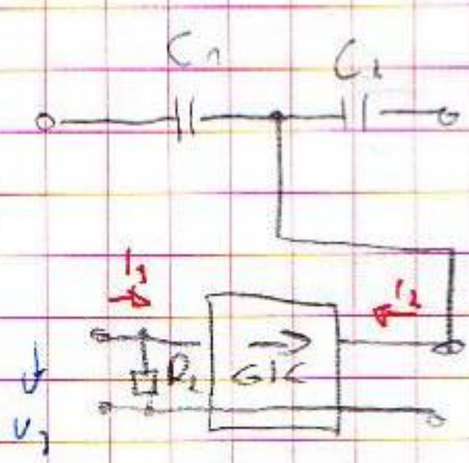
$U_1=U_2$ $\Rightarrow U_1=h_{11}\,i_1+h_{12}\,U_2$

$i_2=-h(s)\cdot i_1 \Rightarrow i_2=h_{21}\,i_1+h_{22}\cdot U_2$

$U_1=U_2$

$i_2=-h(s)\cdot i_1$





$U_1=U_2$

$i_1=-\frac{U_1}{R_2}=-\frac{U_2}{R_2}$

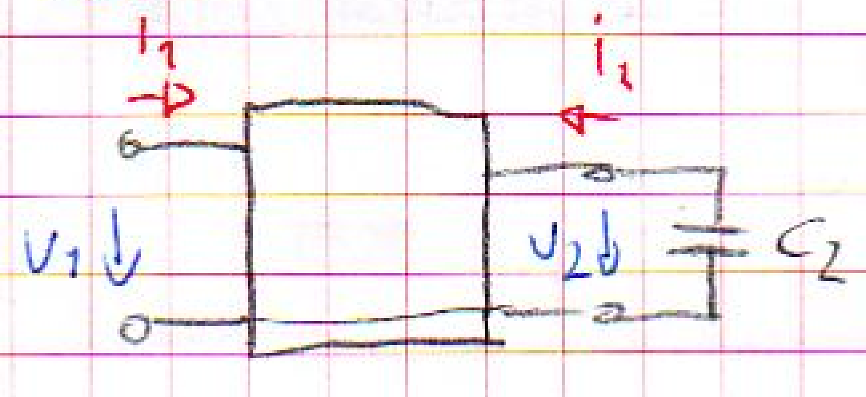
$i_2=+h(s)\cdot\frac{U_2}{R_2}$

$\Rightarrow \frac{U_2}{I_2}=\frac{R_2}{h(s)} \Rightarrow \frac{R}{\frac{w_B}{s}}=s\left(\frac{R_2}{w_B}\right)$

$\downarrow$

L_2

fordítva



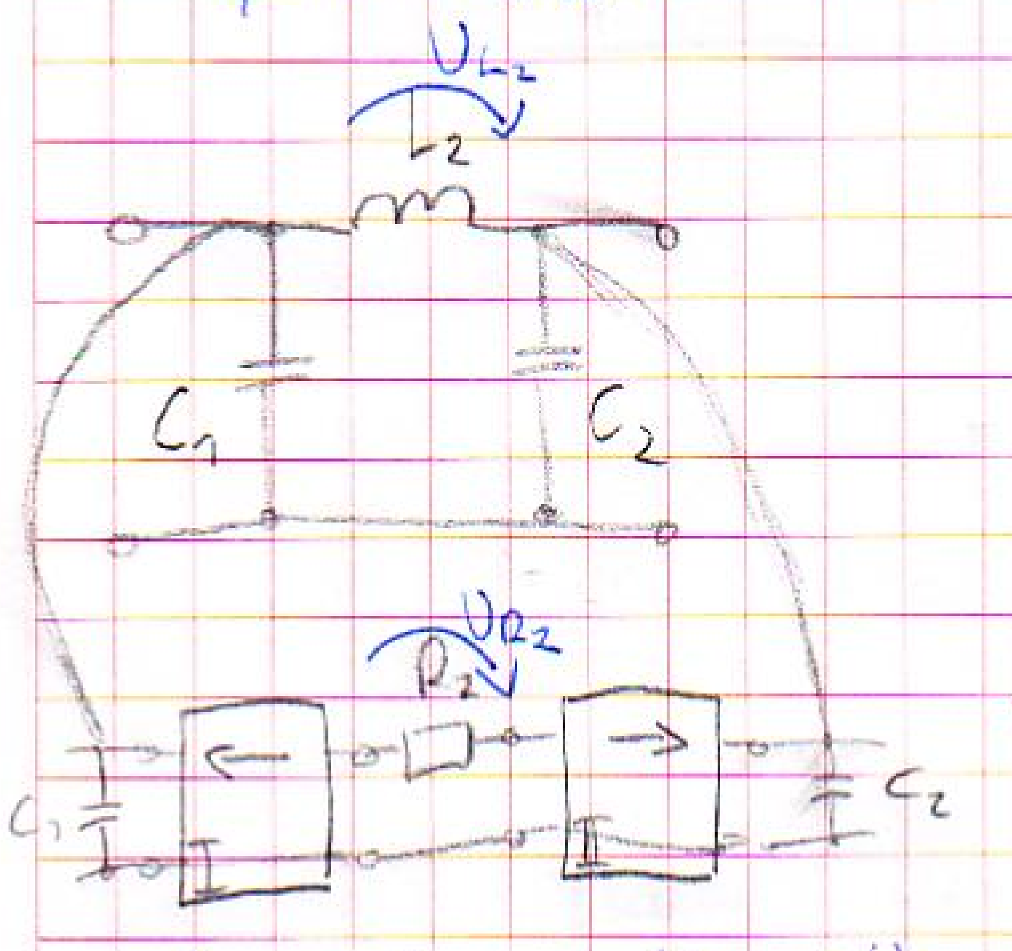
$U_1 = U_2$

$i_2 = -h(s) \cdot i_1 \Rightarrow \frac{U_1}{i_1} = Z_{be} = \frac{U_2}{i_1} = -\frac{U_2}{i_2} \cdot (-h(s)) = \frac{U_2}{i_2} \cdot h(s) = Z_2 \cdot h(s) = Z_2 \cdot \frac{\omega_B}{s}$

$\hookrightarrow i_1 = -\frac{i_2}{h(s)}$

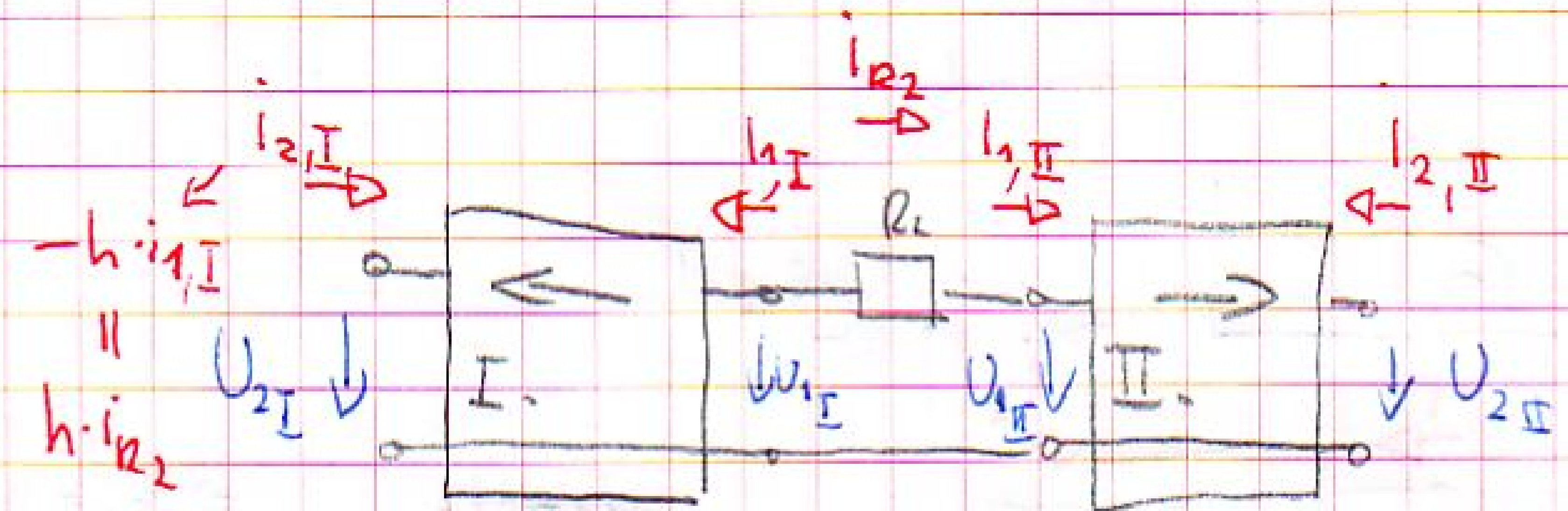
$\Rightarrow \frac{1}{sC_2} \cdot \frac{\omega_B}{s} = \frac{1}{s^2} \frac{\omega_B}{C_2} = \frac{1}{D^*}$

potenciál független:



$U_1 = U_2$

$U_{L_2} = U_{R_2}$



$U_{1_I} = U_{1,II} \quad U_{2_I} = U_{2_{II}}$

$i_{R_2} = \frac{U_{R_2}}{R_2}$

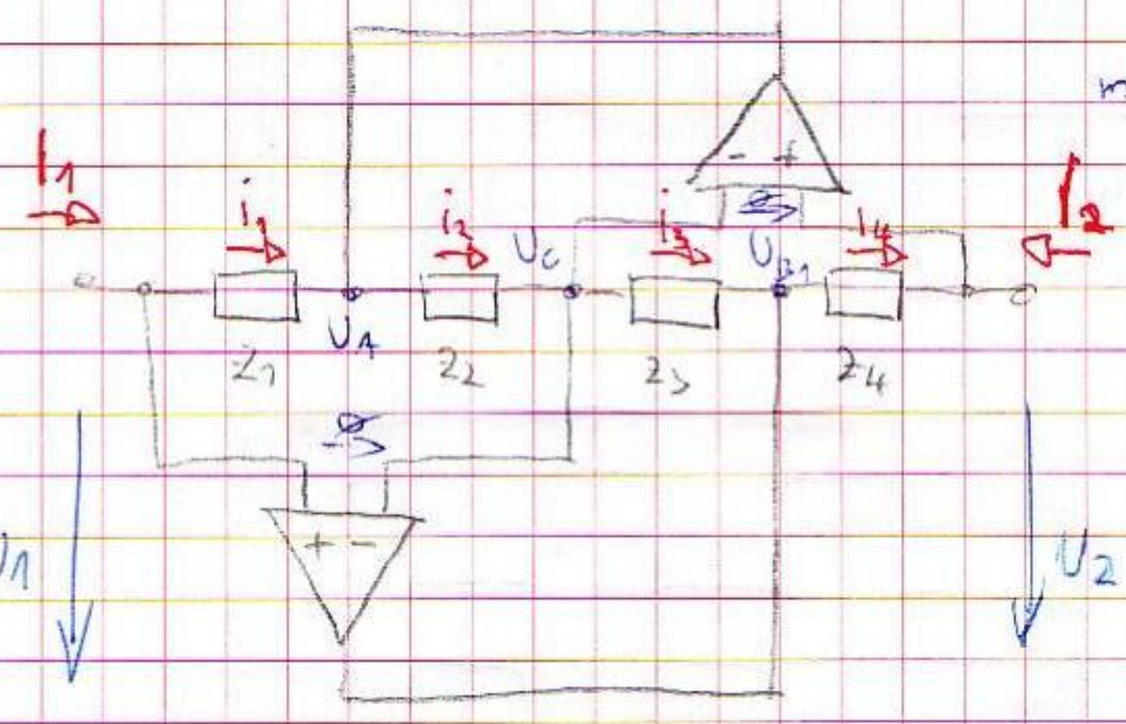
$i_{1,I} = -i_{1,II}$; $i_{1_{II}} = +i_{R_2}$

$h \frac{U_{L_2}}{R_2} \Rightarrow \frac{U_{L_2}}{R_2} \cdot \frac{\omega_B}{s}$

$\frac{U_{L_2}}{I_{L_2}} = \frac{U_{L_2}}{\frac{U_{L_2}}{R_2} \frac{\omega_B}{s}} = s \cdot \frac{R_2}{\omega_B}$

GIC-vel szuperkapacitás is létrehozható 

GIC megvalósítása műveleti erősítővel I



me. $\Rightarrow U^+ - U^- = 0 \Rightarrow \underline{U_1 = U_2}$

$$I_1 \cdot Z_1 + I_2 \cdot Z_2 = 0$$

$$i_3 Z_3 + i_4 Z_4 = 0$$

me $I_2 = I_3 = i$

$$\Rightarrow \underline{I_1 \cdot Z_1 + i \cdot Z_2 = 0} \quad \Rightarrow \quad i_1 \frac{Z_1}{Z_2} + i = 0 \quad \Rightarrow \quad i = -i_1 \frac{Z_1}{Z_2}$$

$$\underline{i \cdot Z_3 + i_4 \cdot Z_4 = 0} \quad \Rightarrow \quad i + i_4 \frac{Z_4}{Z_3} = 0 \quad \Rightarrow \quad i = -I_4 \frac{Z_4}{Z_3} \quad \Rightarrow$$

$$\Rightarrow i_1 \cdot \frac{Z_1}{Z_2} = i_4 \cdot \frac{Z_4}{Z_3}$$

$$\left(\begin{array}{l} I_1 = i_1 \\ I_2 = -i_4 \end{array} \right)$$

$$\Rightarrow i_4 \cdot \frac{Z_4 Z_2}{Z_3 Z_1} = i_1$$

$$I_2 = -I_1 \cdot \underbrace{\frac{Z_4 \cdot Z_2}{Z_3 \cdot Z_1}}_{h(j)}$$