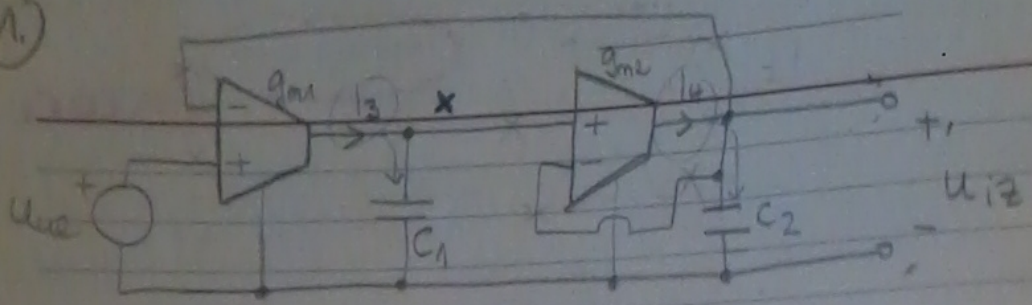
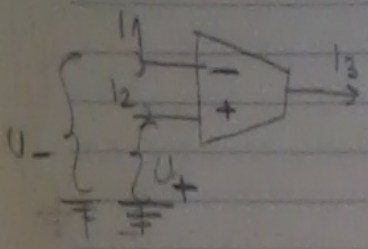
prijenosne funkcije

DATUM / DATE

$H(s) = \frac{U_{iz}(s)}{U_{ul}(s)} = ?$

1.





$I_3 = g_m (U_+ - U_-)$

$I_1 = I_2 = 0$

} def. jedn. strminskog pojačala

(1) $I_3 = g_{m1}(u_{ul} - u_{iz})$

(2) $I_4 = g_{m2}(u_x - u_{iz})$

(3) $U_x = I_3 \frac{1}{sC_1}$

(4) $u_{iz} = I_4 \frac{1}{sC_2}$

(3), (4) u (1)(2)

(1) $U_x \cdot sC_1 = g_{m1} u_{ul} - g_{m1} u_{iz} \Rightarrow U_x = u_{ul} \cdot \frac{g_{m1}}{sC_1} - u_{iz} \frac{g_{m1}}{sC_1}$

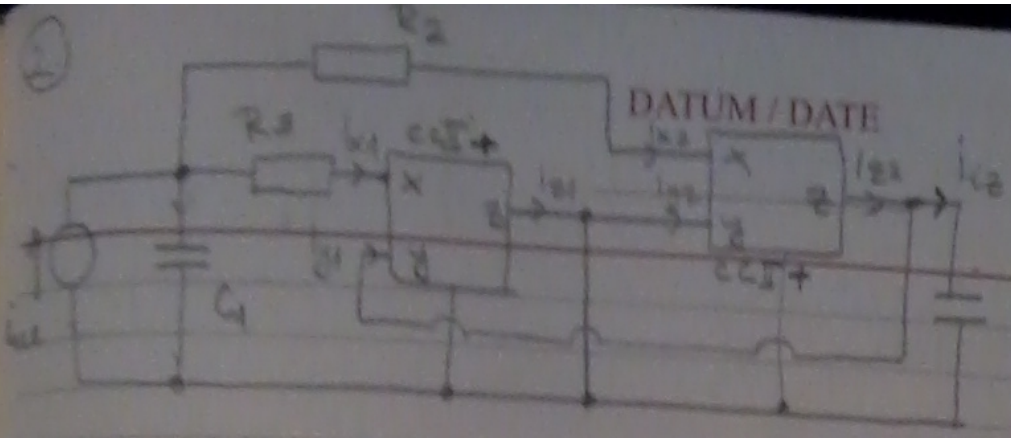
(2) $sC_2 u_{iz} = g_{m2} u_x - g_{m2} u_{iz}$

(1)u(2) $sC_2 u_{iz} = g_{m2} \cdot \frac{g_{m1}}{sC_1} u_{ul} - g_{m2} \frac{g_{m1}}{sC_1} u_{iz} - g_{m2} u_{iz}$

$u_{iz}\left(sC_2 + \frac{g_{m1} g_{m2}}{sC_1} + g_{m2}\right) = \frac{g_{m1} g_{m2}}{sC_1} u_{ul}$

$$H(s) = \frac{u_{iz}(s)}{u_{ul}(s)} = \frac{\frac{g_{m1} g_{m2}}{sC_1}}{sC_2 + \frac{g_{m1} g_{m2}}{sC_1} + g_{m2}} = \frac{g_{m1} g_{m2}}{s^2 C_1 C_2 + sC_1 g_{m2} + g_{m1} g_{m2}}$$

2)



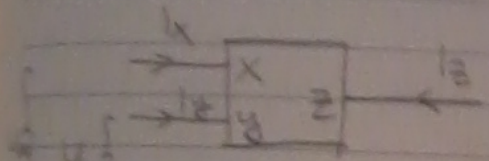
$R_2 = R_3 = 1$

$C_1 = C_4 = 1$

a) $H_1(s) = \frac{u_{iz}}{u_{ul}}$

b) $u_{ul}(t) = \delta(t)$

$u_{iz}(t) = ?$



$i_y = 0$

$U_x = U_y$

$i_z = I\, i_x$

def. jedn. strujnog prijenosnika CCII.

$\pm$ 2a ccII+
$-$ 2a ccII$-$

ovo vrijedi za i_x i i_z obje gledaju u ccII ili obje gledaju iz ccII

(1) $i_{ul} = u_{ul} \cdot sC_1 + i_{x1} + i_{x2}$

(2) $-i_{z1} = i_{x1} = \frac{u_{ul} - u_{x1}}{R_3} = \frac{u_{ul} - u_{y1}}{R_3} = \frac{u_{ul} - u_{iz}}{R_3}$

(3) $u_{iz} = u_{z2} = -i_{x2} = -\frac{u_{ul} - u_{x2}}{R_3} = -\frac{u_{ul} - u_{y2}}{R_2} = -\frac{u_{ul}}{R_2}$

(4) $u_{iz} = u_z \cdot \frac{1}{sC_4}$

(2), (3) u (1)

$$i_{ul} = -R_2 u_{iz} \cdot sC_1 + \frac{u_{ul} - u_{iz}}{R_3} + \frac{u_{ul}}{R_2}$$

(3,4) u (1)

$$i_{ul} = -R_2 sC_1 u_z + \frac{1}{R_3}(-u_z R_2) - \frac{1}{R_3} \cdot \frac{1}{sC_4} u_z + \frac{1}{R_2}(-u_z R_2)$$

$$i_{ul} = -u_z \left(s + 1 + \frac{1}{s} + 1 \right)$$

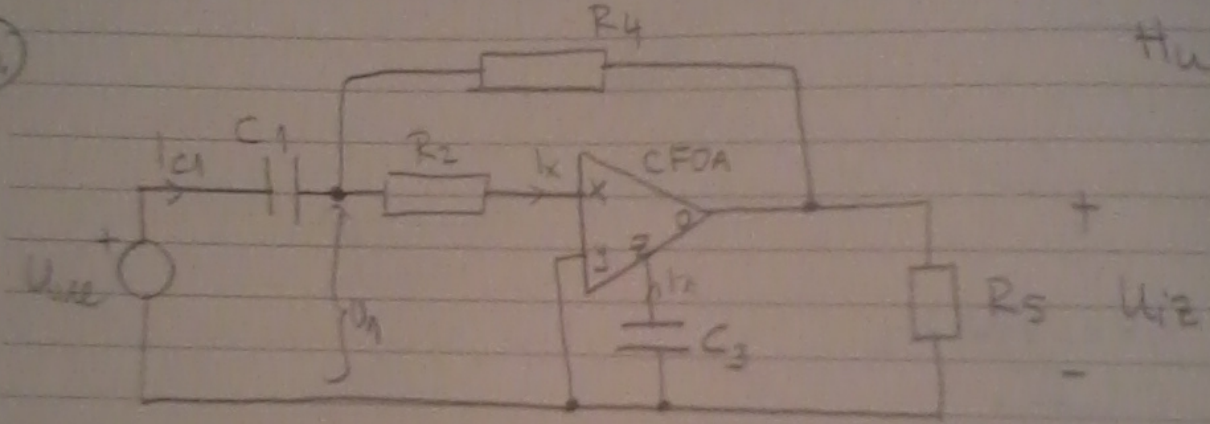
$$H_1(s) = \frac{i_{iz}}{i_{ul}} = \frac{-1}{s+2+\frac{1}{s}} = -\frac{s}{s^2+2s+1}$$

b) $i_{ul}(t) = \varepsilon(t) \multimap I_{ul}(s) = \frac{1}{s}$

$$I_{iz}(s) = I_{ul}(s) \cdot H(s) = \frac{-1}{s^2+2s+1} = \frac{-1}{(s+1)^2}$$

$$\rightarrow \boxed{i_{iz}(t) = -te^{-t}\,\varepsilon(t)}$$

(3.)



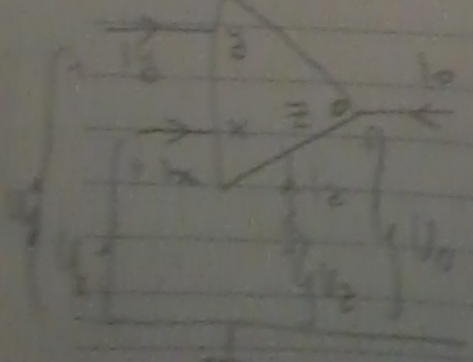
$$H_u(s) = \frac{U_{iz}}{U_{ul}} = 1$$

Strujno pojačalo sa strujnom povratnom vezom

$U_x = U_y$
$I_y = 0$
$I_z = I_x$
$U_o = U_z$

priključnica CFOA	impedancijski nivo
x	nizak (idealno 0)
y	visok ($\to \infty$)
z	visok ($\to \infty$)
o	nizak ($\to 0$)

def. jed. CFOA



DATUM / DATE

$U_x = U_y = 0$

(1) $U_1\left(\frac{1}{R_2} + \frac{1}{R_4} + sC_1\right) - U_{ul}\,sC_1 - U_{iz}\frac{1}{R_4} = 0$

(2) $I_x = I_z \Rightarrow \frac{U_1}{R_2} = -U_2\,sC_3 = -U_{iz}\,sC_3$

(2) u (1) $-U_{iz}\,sR_2C_3\left(\frac{1}{R_2} + \frac{1}{R_4} + sC_1\right) - U_{ul}\,sC_1 - U_{iz}\frac{1}{R_4} = 0$

$U_{iz}\left(sC_3 + sC_3\frac{R_2}{R_4} + s^2R_2C_1C_3 + \frac{1}{R_4}\right) = -U_{ul}\,sC_1$

$$H(s) = \frac{U_{iz}}{U_{ul}} = -\frac{sC_1}{sC_3 + sC_3\frac{R_2}{R_4} + s^2R_2C_1C_3 + \frac{1}{R_4}} =$$

$$= -\frac{sC_1R_4}{s^2C_1R_2C_3R_4 + sC_3(R_2 + R_4) + 1}$$