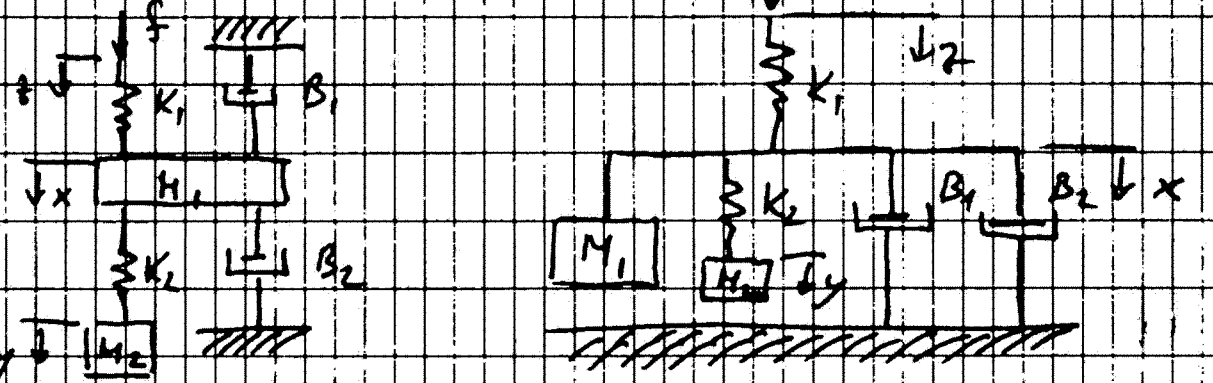
1. Należy



$$Z_{B_1} = \frac{M_2 K_2 D^2}{M_2 D^2 + K_2}$$

$$Z_2 = \frac{M_2 K_2 D^2 + (M_1 D^2 + B_1 D + B_2 D)(M_2 D^2 + K_2)}{M_2 D^2 + K_2}$$

$$= \frac{M_1 M_2 D^4 + M_2 B_1 D^3 + M_2 B_2 D^3 + M_1 K_2 D^2 + M_2 K_2 D^2 + B_1 K_2 D + B_2 K_2 D}{M_2 D^2 + K_2}$$

$$Z_{cal} = \frac{Z_2 \cdot K_1}{Z_2 + K_1}$$

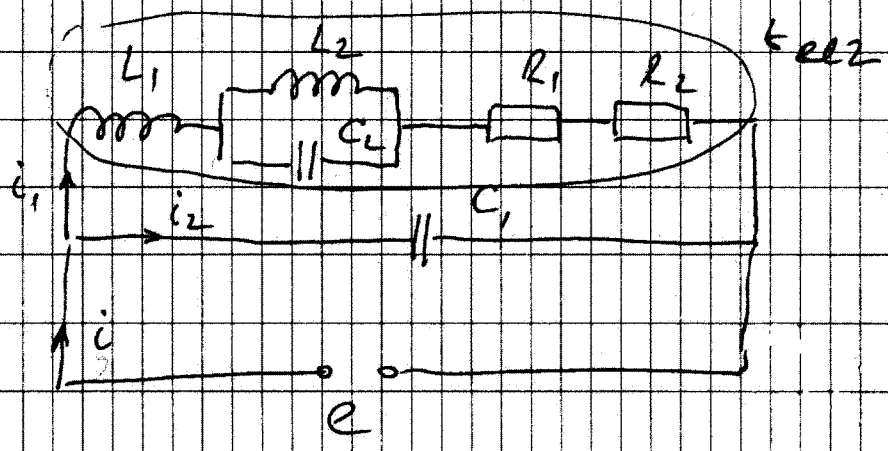
$$= \frac{M_1 M_2 K_1 D^4 + M_2 B_1 K_1 D^3 + M_2 B_2 K_1 D^3 + M_1 K_1 K_2 D^2 + M_2 K_1 K_2 D^2 + B_1 K_1 K_2 D + B_2 K_1 K_2 D}{M_1 M_2 D^4 + M_2 B_1 D^3 + M_2 B_2 D^3 + M_1 K_2 D^2 + M_2 K_2 D^2 + B_1 K_2 D + B_2 K_2 D + K_1 K_2}$$

$$f = Z_{cal} \cdot x = Z_2 \cdot x$$

$$\frac{x}{f} = \frac{1}{Z_2}$$

$$= \frac{M_2 D^2 + K_2}{M_1 M_2 D^4 + M_2 B_1 D^3 + M_2 B_2 D^3 + M_1 K_2 D^2 + M_2 K_2 D^2 + B_1 K_2 D + B_2 K_2 D}$$

ⓐ direkter analog



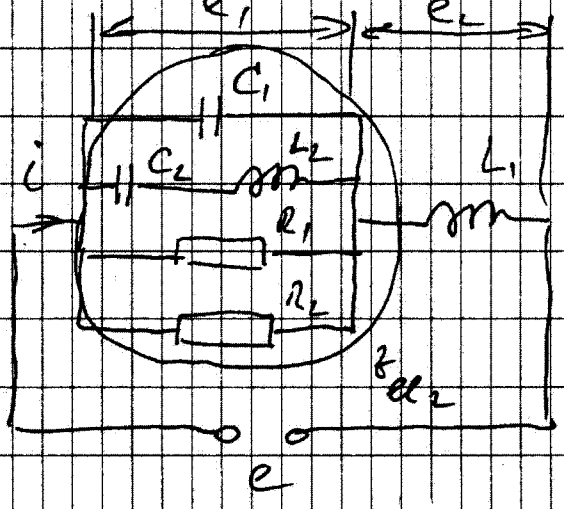
$i \sim Dq$

$i_1 \sim Dq_1$ ✗

$i_2 \sim Dq_2$

$$\frac{i}{e} = \frac{1}{Z_{el}} \quad \frac{i_1}{e} = \frac{Dq_1}{e} = \frac{1}{Z_{el2}} \Rightarrow \boxed{\frac{e_1}{e} = \frac{1}{D\, Z_{el2}}}$$

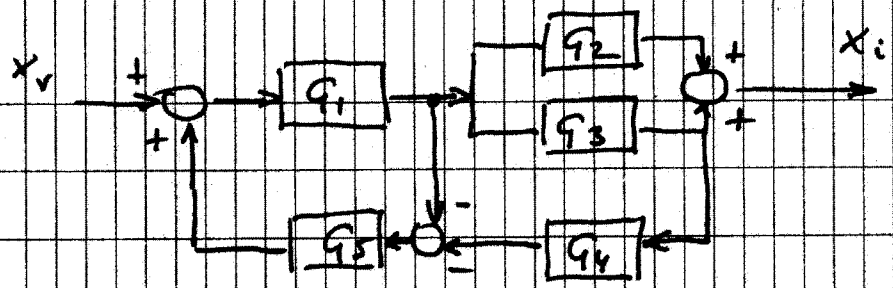
ⓑ inverser analog

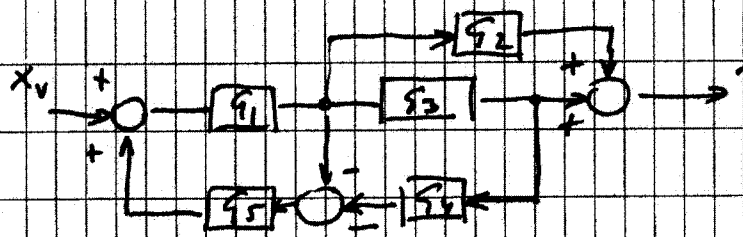


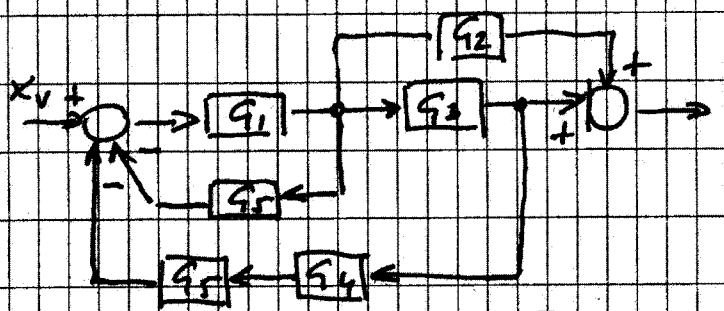
$$\frac{e}{i} = Z_{el}$$

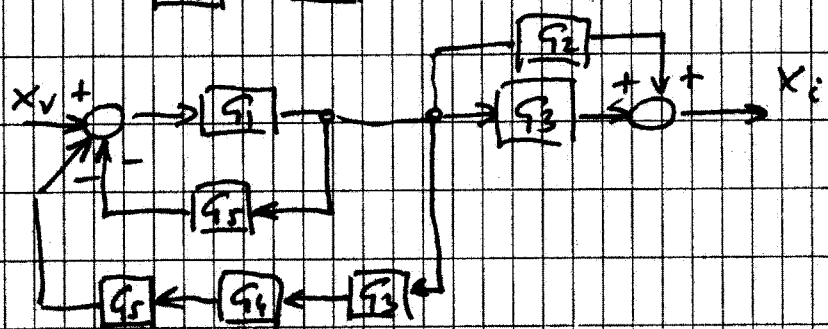
$$\boxed{\frac{e_1}{i} = Z_{el2}}$$

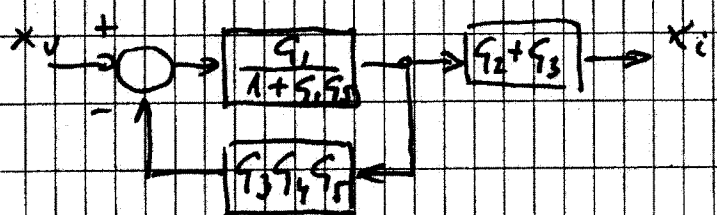
$i \sim Dx$

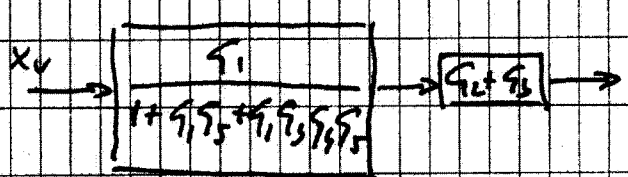

x_v
+
+
G_1
G_2
G_3
+
+
x_i
G_5
−
G_4

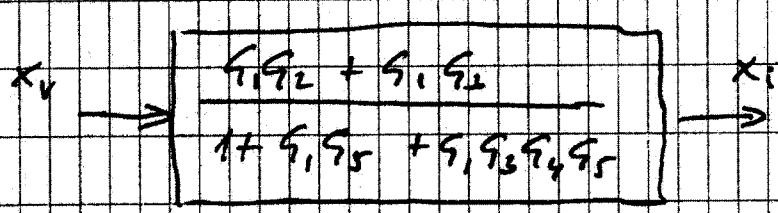

x_v
+
+
G_1
G_2
G_3
+
+
x_i
G_5
−
G_4


x_v
+
−
G_1
G_2
G_3
+
+
x_i
G_5
G_5
G_4


x_v
+
−
G_1
G_2
G_3
+
+
x_i
G_5
G_5
G_4
G_3


x_v
+
−
$\frac{G_1}{1+G_1G_5}$
G_2+G_3
x_i
$G_3G_4G_5$


x_v
$\frac{G_1}{1+G_1G_5+G_1G_3G_4G_5}$
G_2+G_3
x_i


x_v
$\frac{G_1G_2+G_1G_3}{1+G_1G_5+G_1G_3G_4G_5}$
x_i