Signal Flow Graph

Vin
-1 V_1
R/R_g $1/sRC_1$ R/sL_2 $1/sRC_3$ R/R_L
-1 V_3 V_L
RI_0 -1 RI_2 -1 RI_4

Signal flow graph

Vin
-1 V_1 -1 -1
R/R_g $1/sRC_1$ R/sL_2 $1/sRC_3$ R/R_L
-1 V_3 V_L
RI_0 -1 RI_2 -1 -1   -1 RI_4

Slides for lecture 7
Ladder reference filter

I_0 I_2 L_2 I_4
Vin R_g V_1 V_3
C_1 C_3 R_L

Gm-C Realization

$-V_1$ g_{m4} g_{m5} V_3

g_{m2} C_4 C_5 C_6 g_{m7}

E g_{m3} $-RI_2$ g_{m6}

g_{m1}

Modified signal flow graph

$-V_1$ $V_L=V_3$

R/R_g $-1/sRC_1$ R/sL_2 $-1/sRC_3$ R/R_L

RI_0 E R/R_g $-RI_2$ RI_4

Scaling of signal flow graph

$-k_1V_1$ k_2 $1/k_3$ $k_1k_2k_3V_L$

R/R_i $-1/sRC_1$ R/sL_2 $-1/sRC_3$ R/R_L

RI_0 E R/R_i k_1 $1/k_2$ $-k_1k_2RI_2$ k_3 RI_4

OP-RC Realization

$-V_1$ R_7 Z R_8 $V_3=V_L$

C_5

C_4 V_L

r C_6

r

inverting buffer

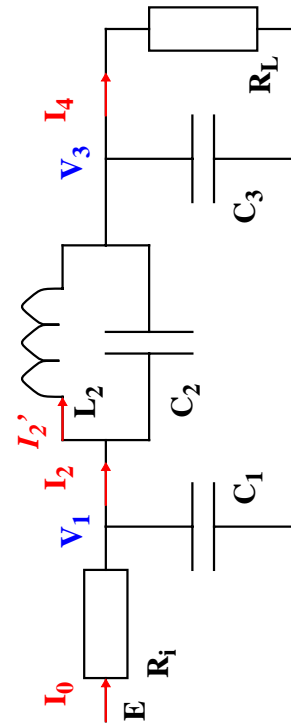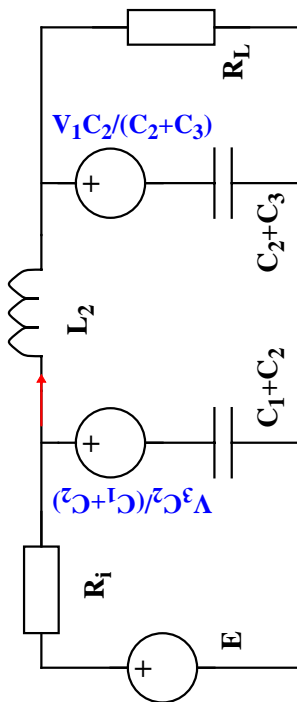R_5 R_6

E X $-RI_2$ R_9 Y R_{10}
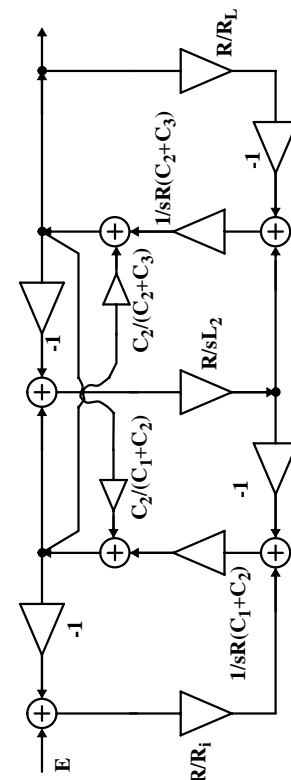
R_4
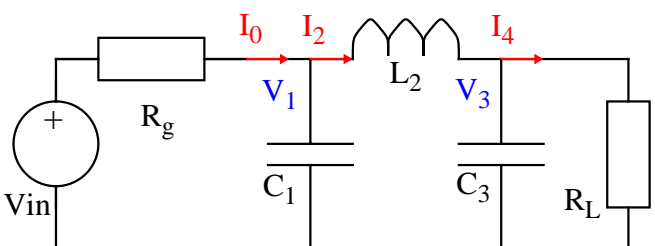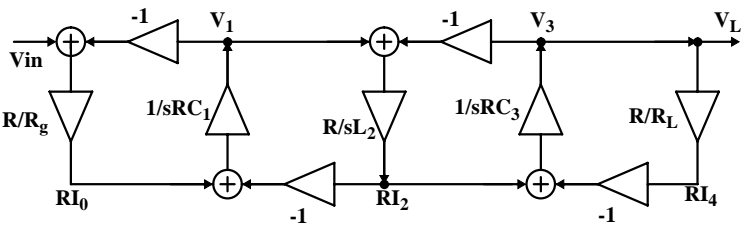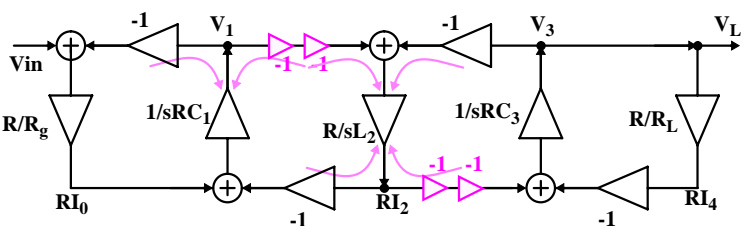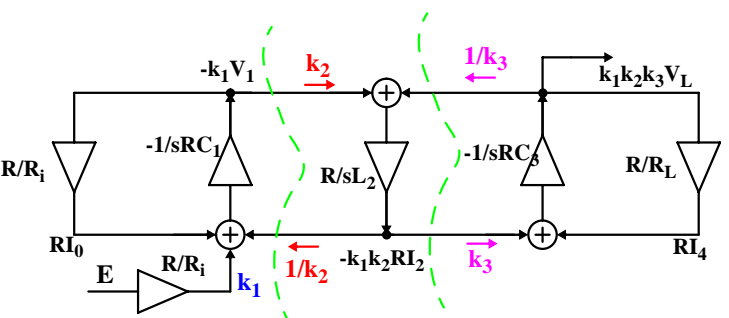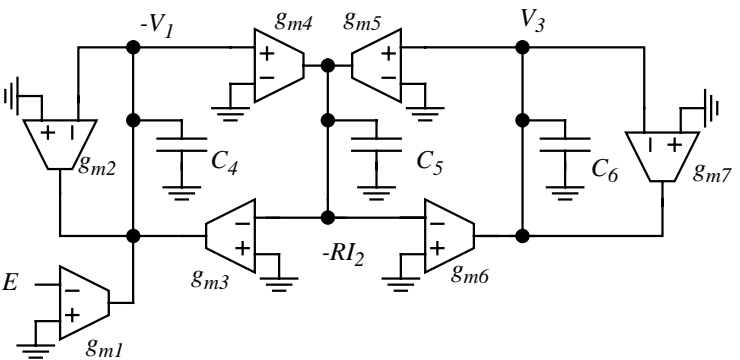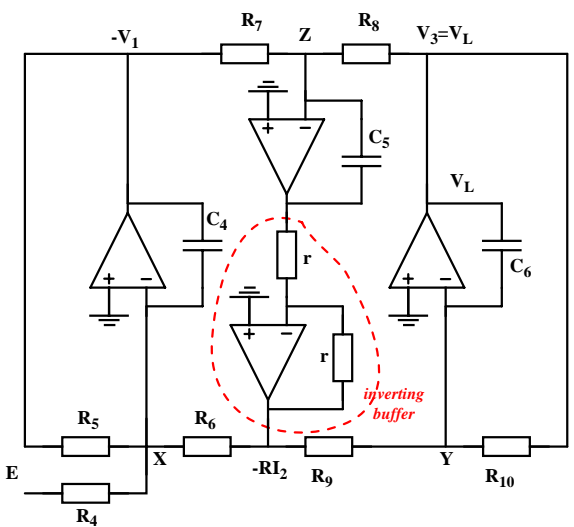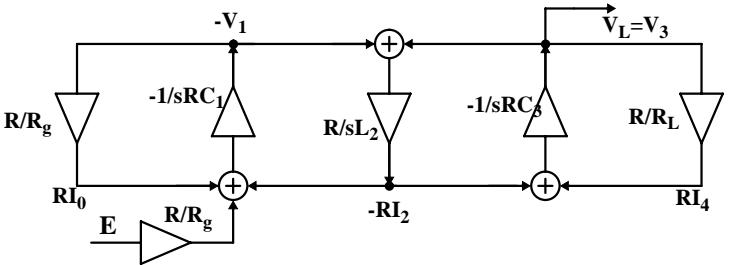
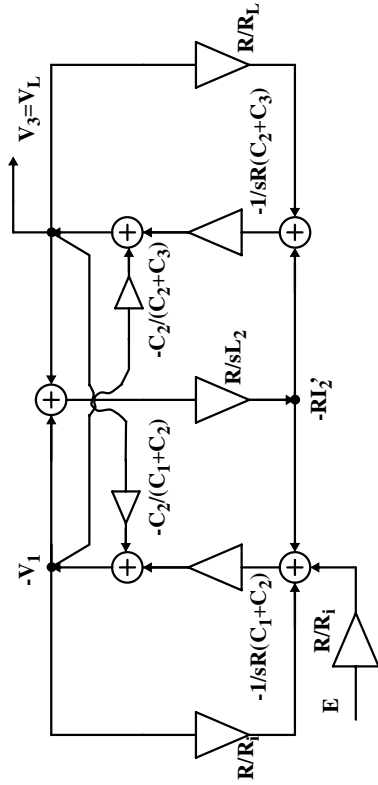## Scaling of OP realization
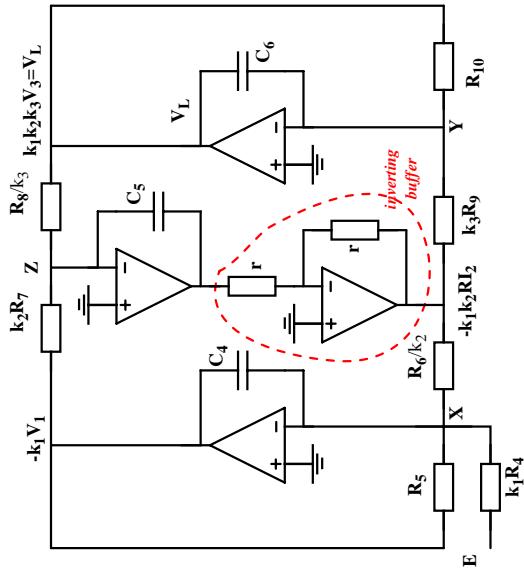
Cauer (elliptic) filters
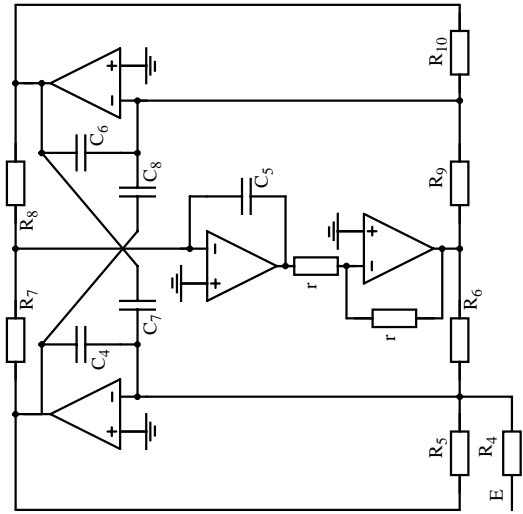
Modified ladder network

Cauer signal flow graph

Modified Cauer signal flow graph

OP-RC realization of Cauer filter

Gm-C realization of Cauer filter