Block diagram

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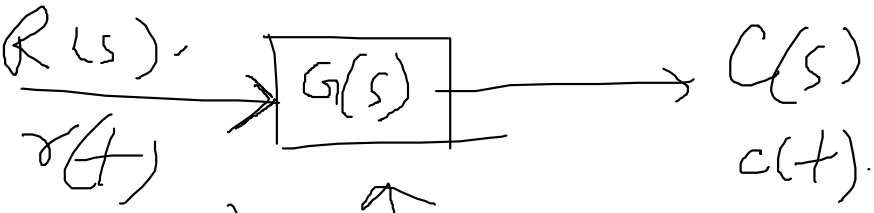
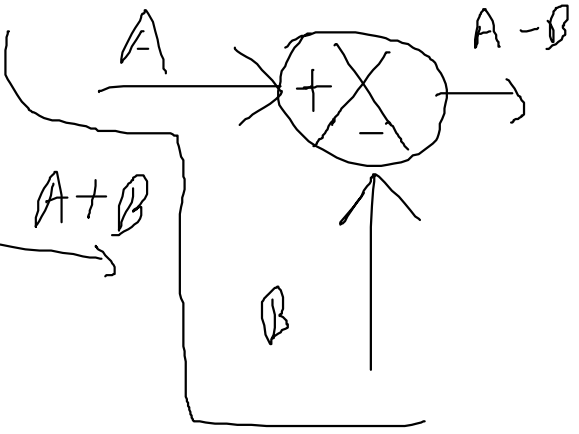
Transfer function

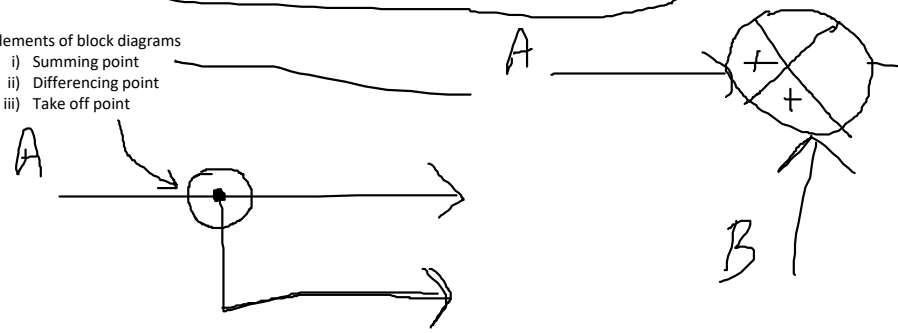


$$G(s) = \frac{C(s)}{R(s)}$$

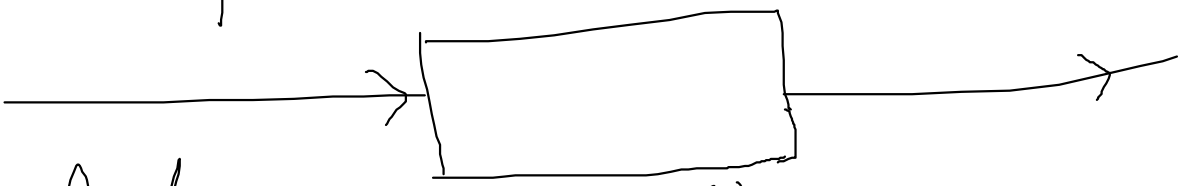


Elements of block diagrams

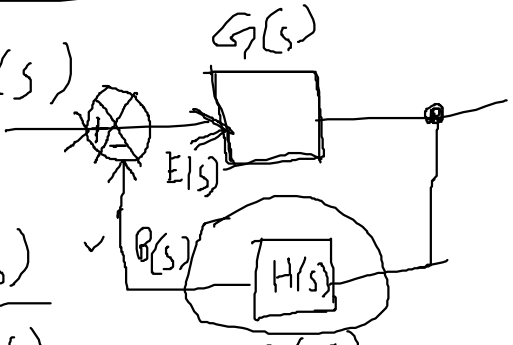
i) Summing point
ii) Differencing point
iii) Take off point



open loop system



closed loop



Input- R(s)
Forward path gain = G(s)
Output= C(s)
Feedback path gain = H(S)
Error = E(S)

$$G(s) = \frac{C(s)}{E(s)}$$

$$H(s) = \frac{B(s)}{C(s)}$$

$$E(s) = R(s) -$$

$$= \frac{C(s)}{R(s) - B(s)} = \frac{\frac{B(s)}{C(s)}}{R(s) - C(s)H(s)}$$

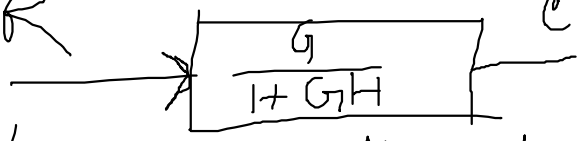
$$G(s) = \frac{C(s)}{R(s) - H(s)C(s)}$$

negative feedback

$$\frac{C(s)}{R(s)} = \frac{G(s)}{1 + G(s)H(s)}$$

$$\frac{C(s)}{R(s)} = \frac{G}{1 - GH}$$

positive feedback



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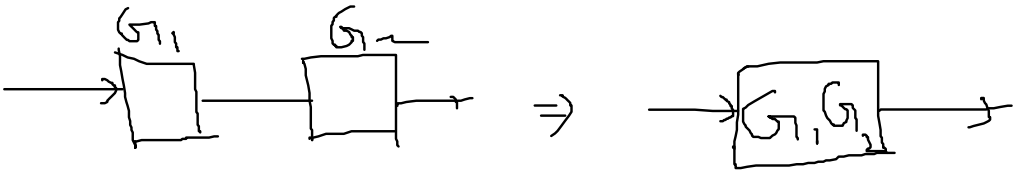
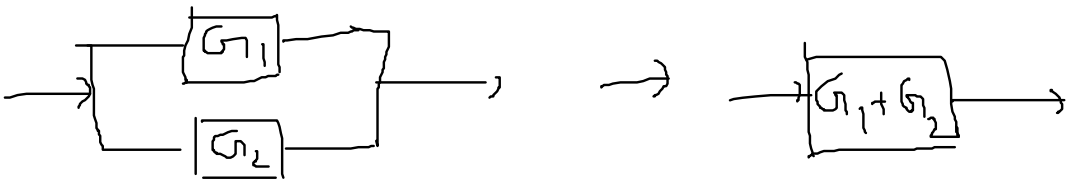
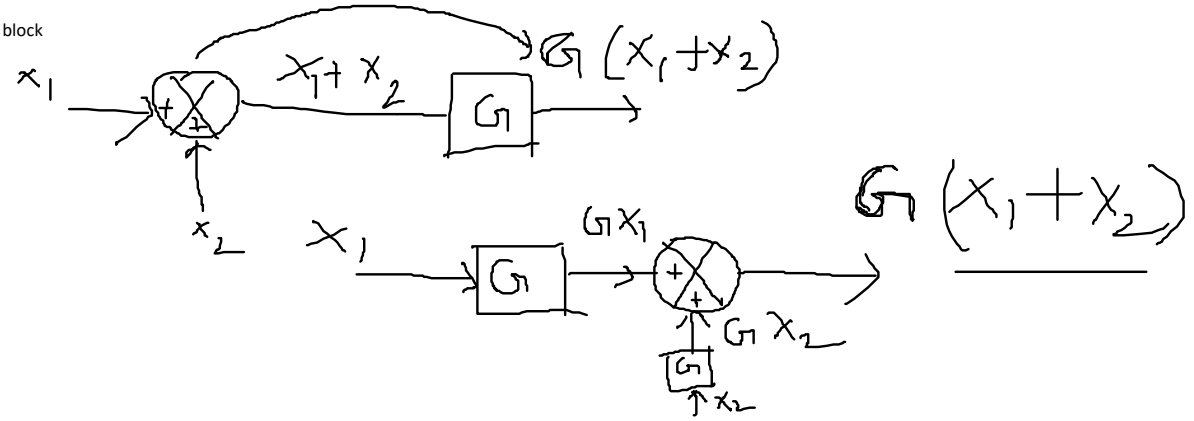
1 Combining blocks in series



2 Combining blocks in parallel



3 Moving a summing point after a block



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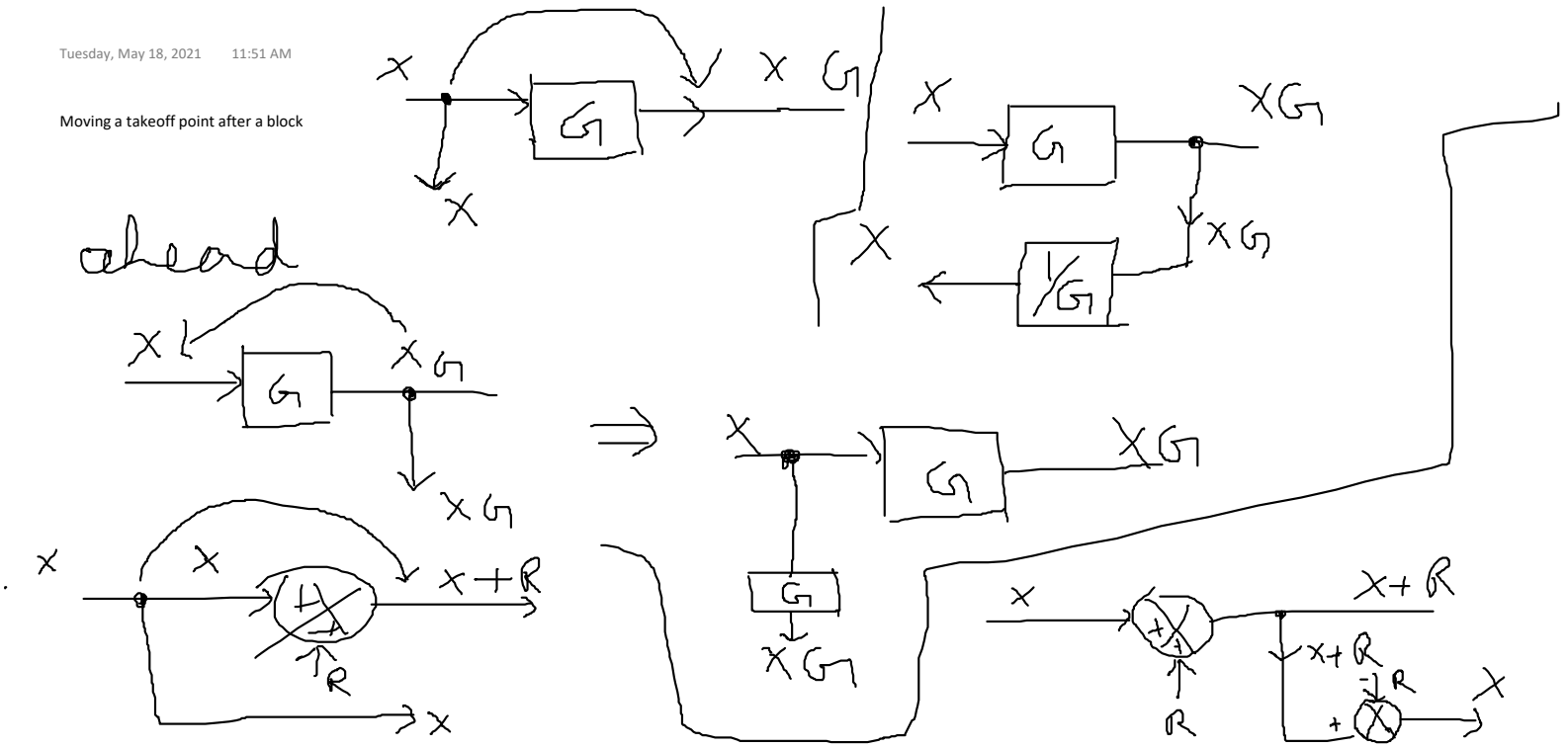
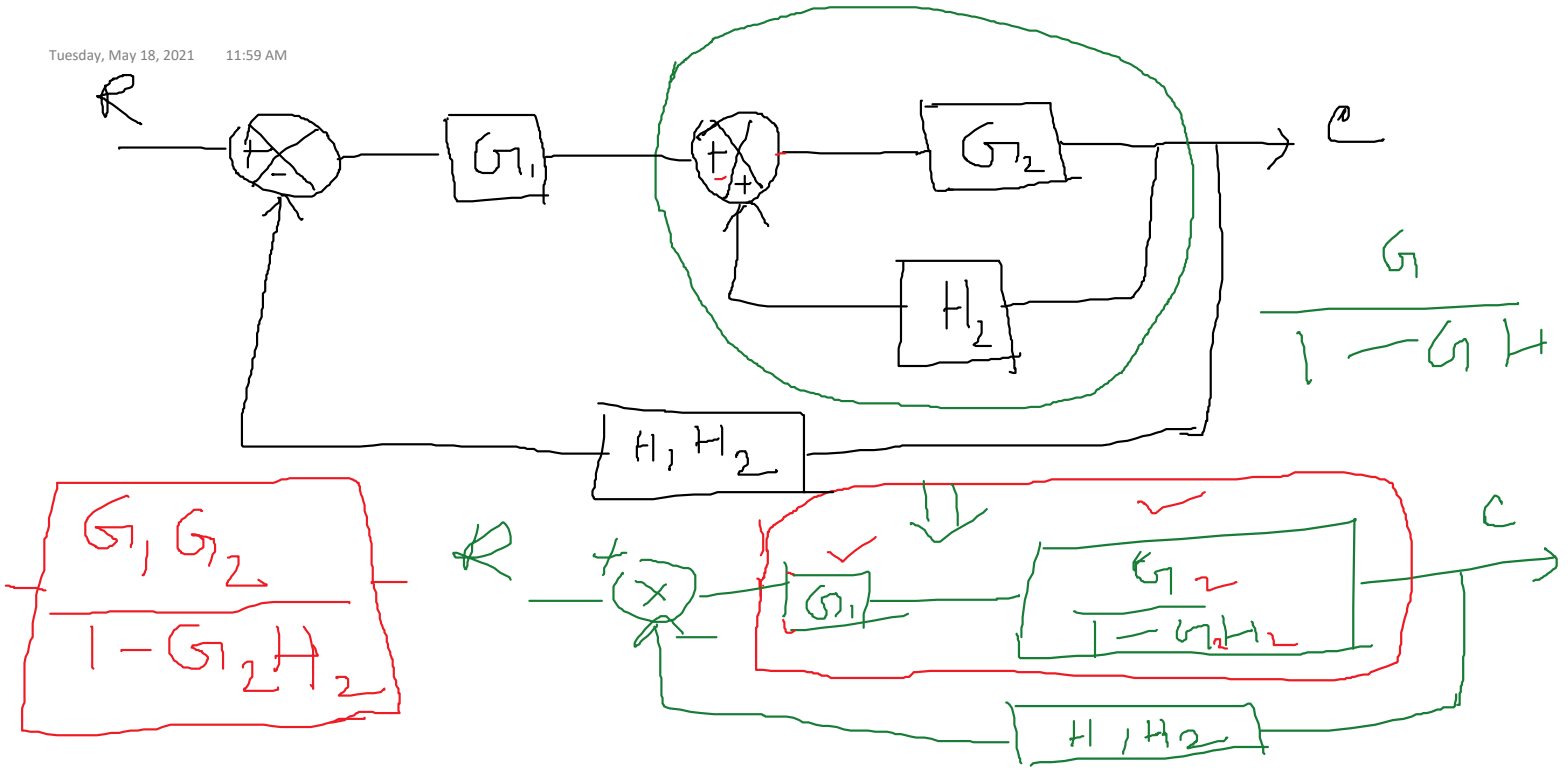
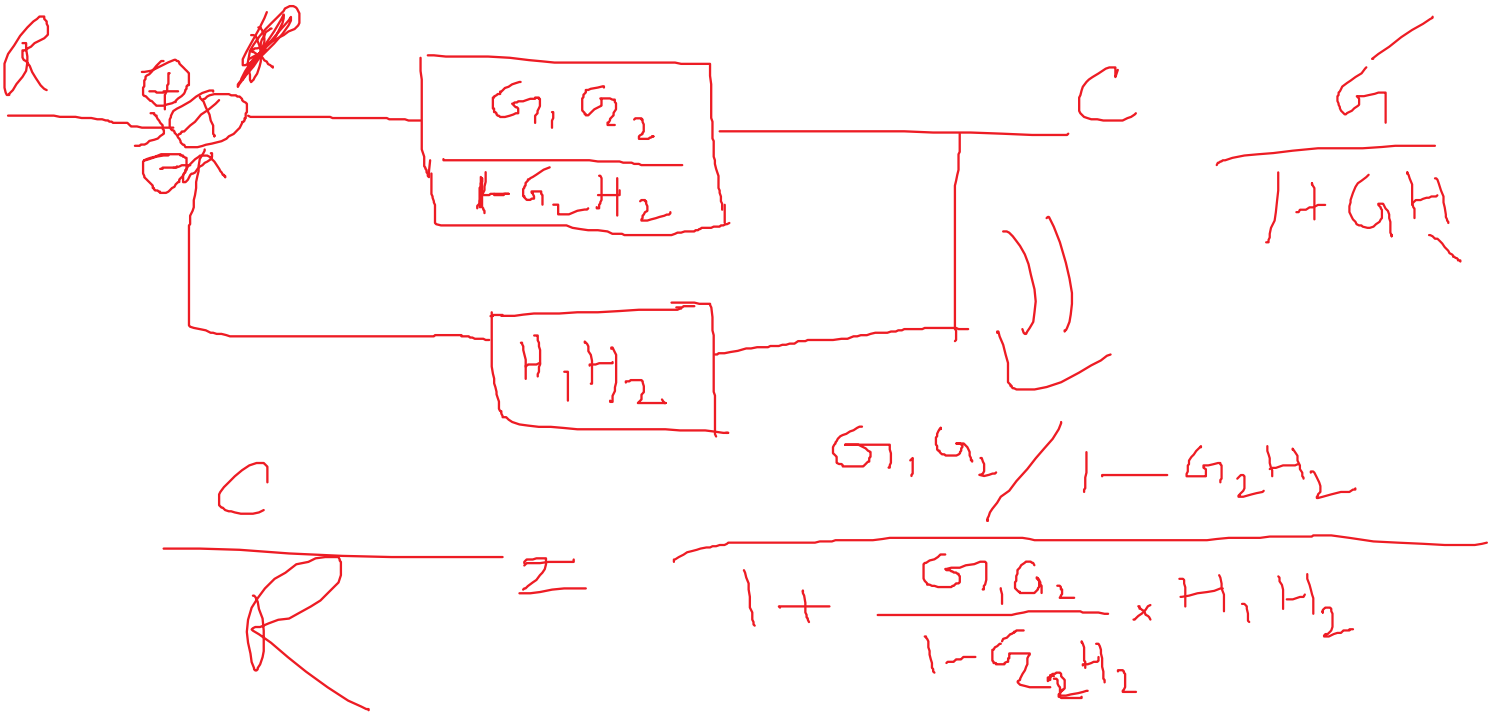
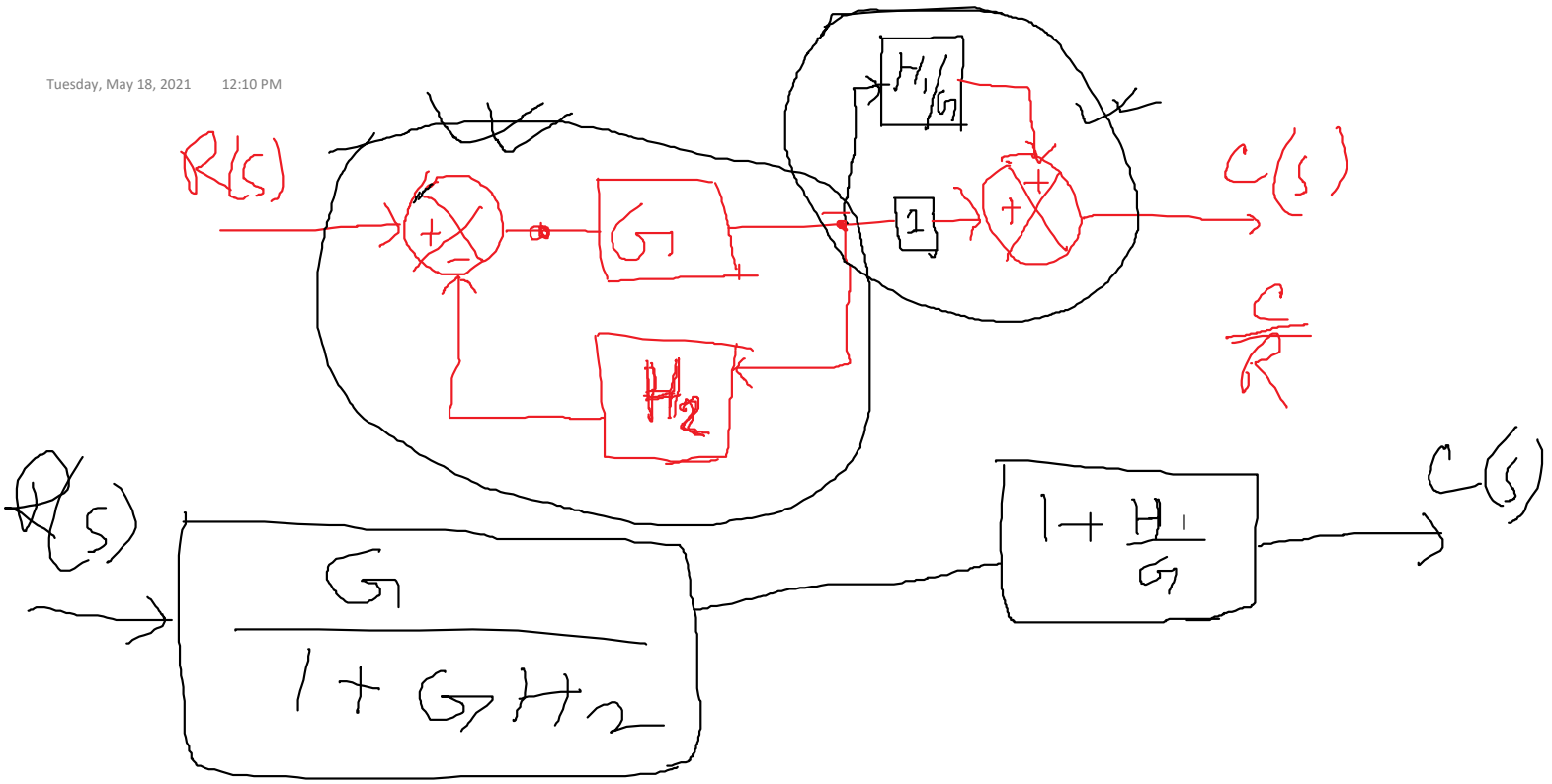
Moving a takeoff point after a block

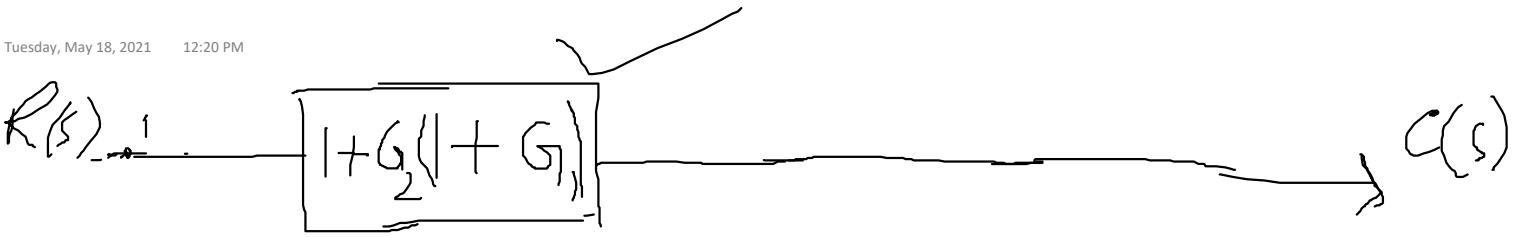



R
G1
G2
H2
C
H1 H2
G1 / (1 − G1 H)
G1 G2 / (1 − G1 G2 H2)
R
G1
G2 / (1 − G2 H2)
C
H1 H2


R
+
−
G1 G2
1−G2H2
C
G
1+G1H
H1H2
C
R
=
G1G2 / 1−G2H2
1 + G1G2 / 1−G2H2 × H1H2


R(s)
G
H2
H1/G
1
C(s)
C/R

R(s)
G / (1 + GH2)
1 + H1/G
C(s)


R(s)
1
1+G2(1+G1)
C(s)