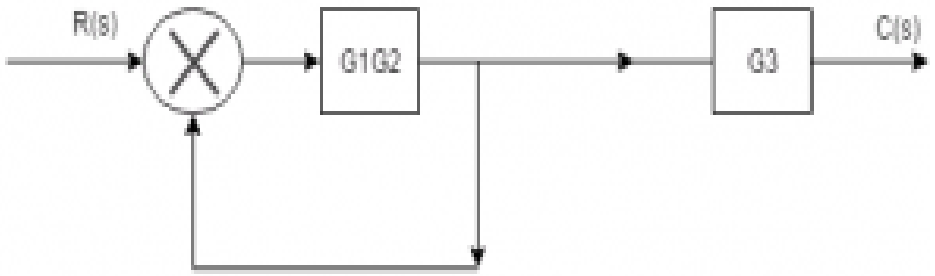
ECE305

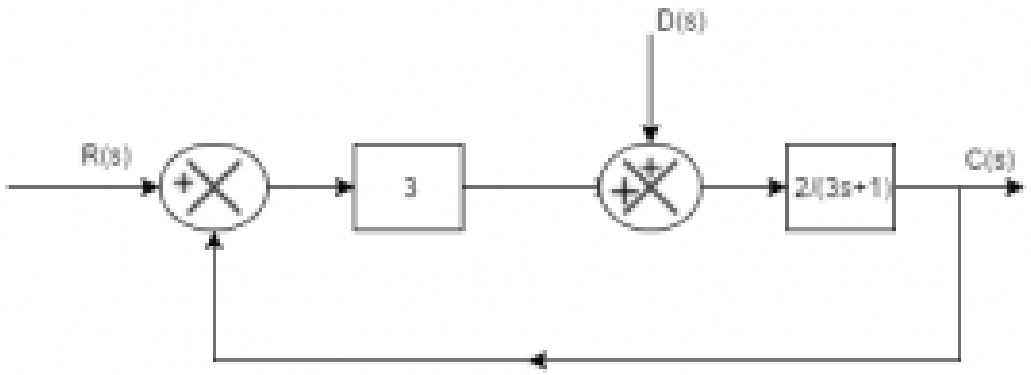
Dr.Anuj Jain

For the block diagram given in the following figure, the expression of C/R is:



a) G1G2G3/1-G2G1
b) G1G2/1-G1G2G3
c) G1G2G3/1-G1G2G3
d) G1G2/G3(1-G1G2)

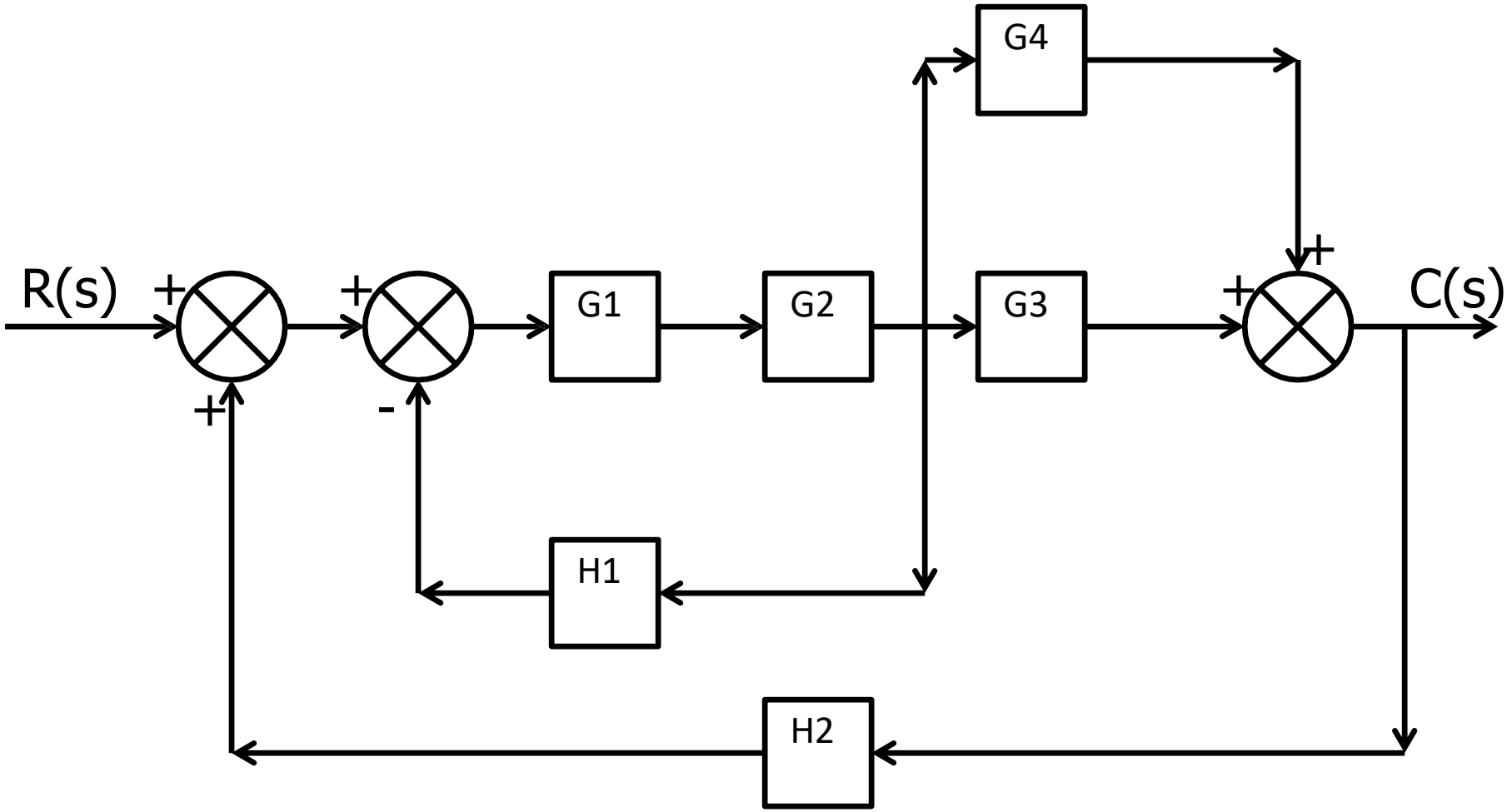
The transfer function from D(s) to Y(s) is :



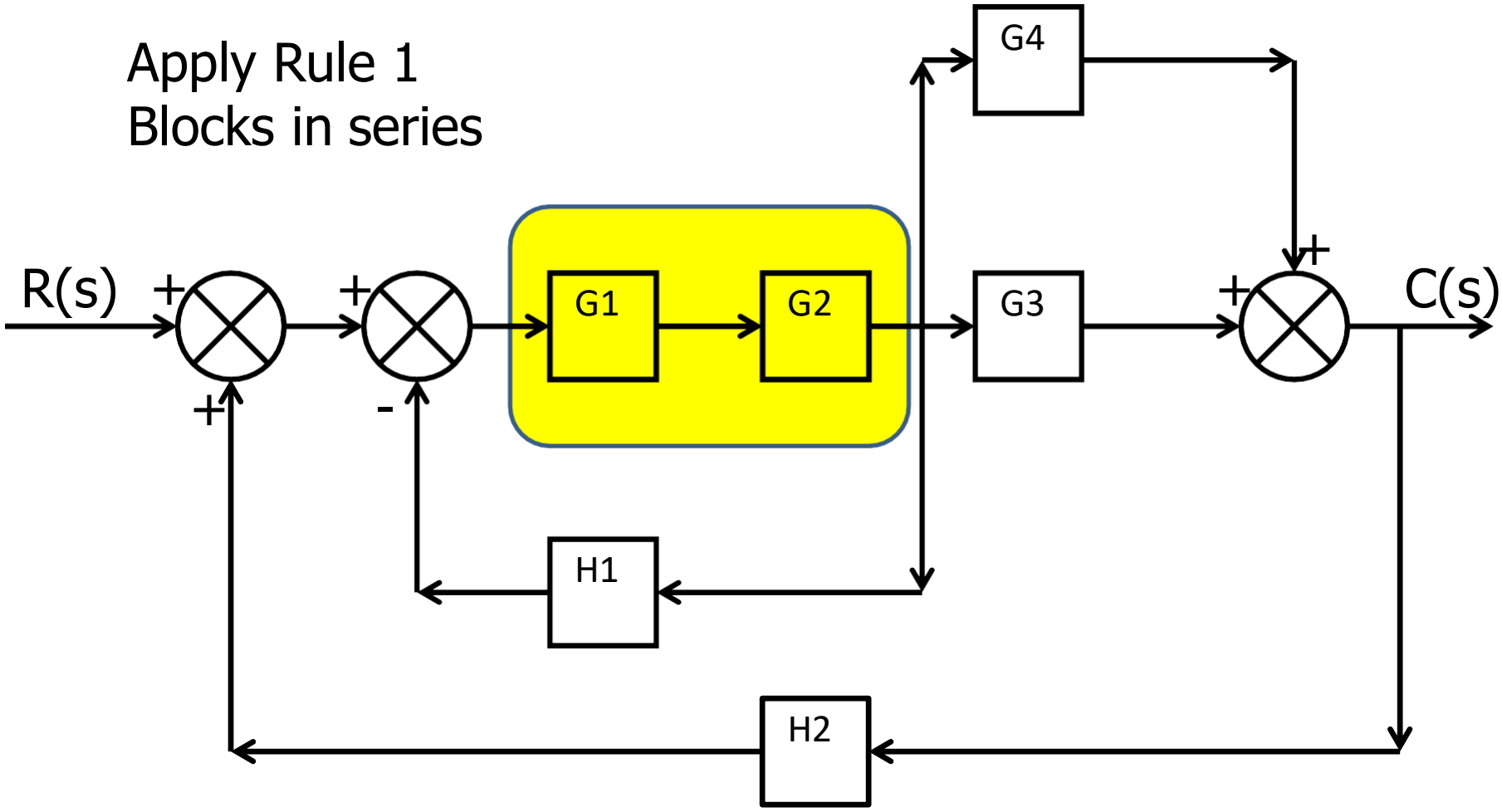
a) 2/3s+7
b) 2/3s+1
c) 6/3s+7
d) 2/3s+6

Answer: a
Explanation: Y(s)/D(s)=2/3s+1/1+3*(2/3s+1)=2/3s+7.

Example 2

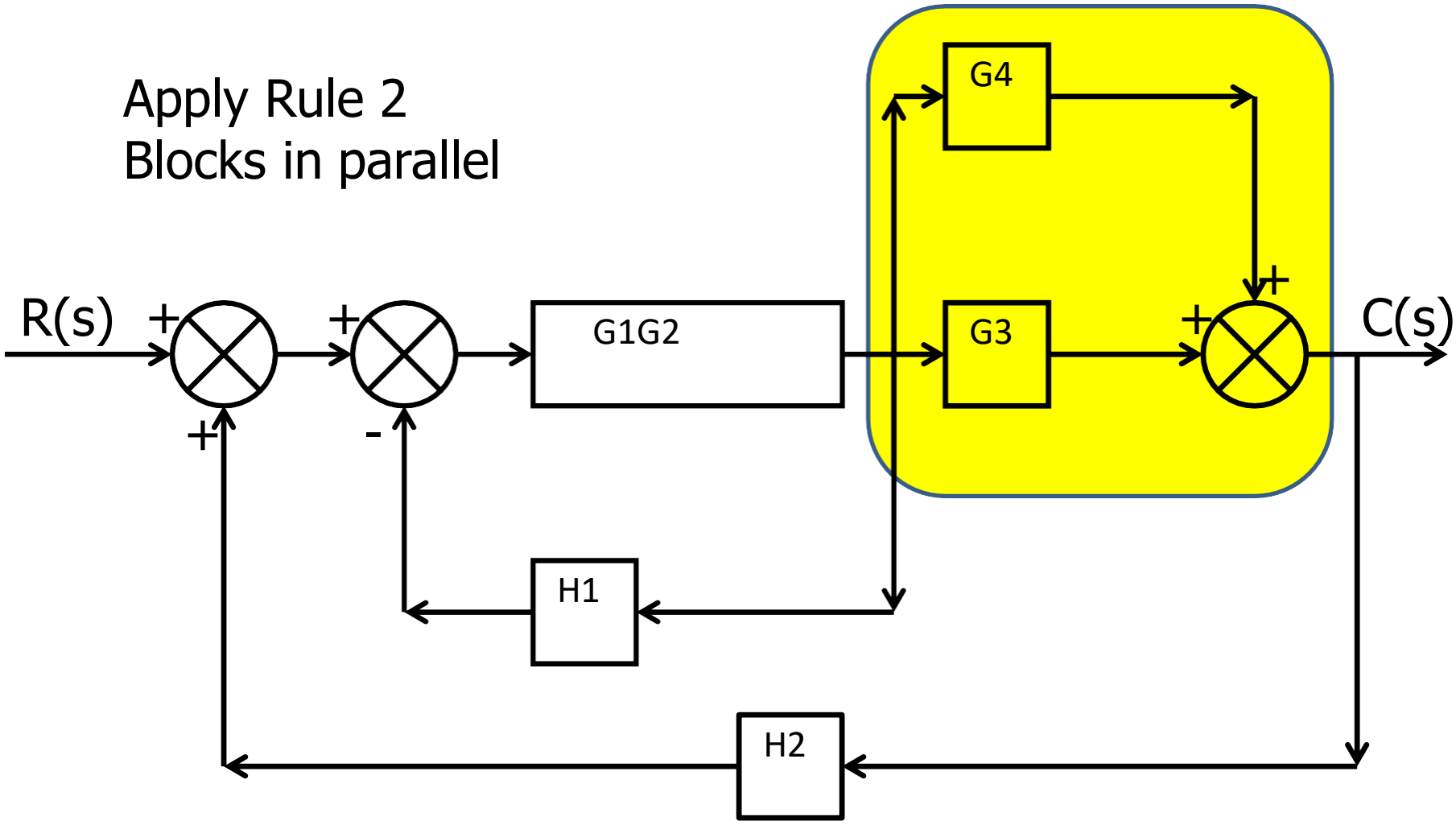


Example 2 cont….



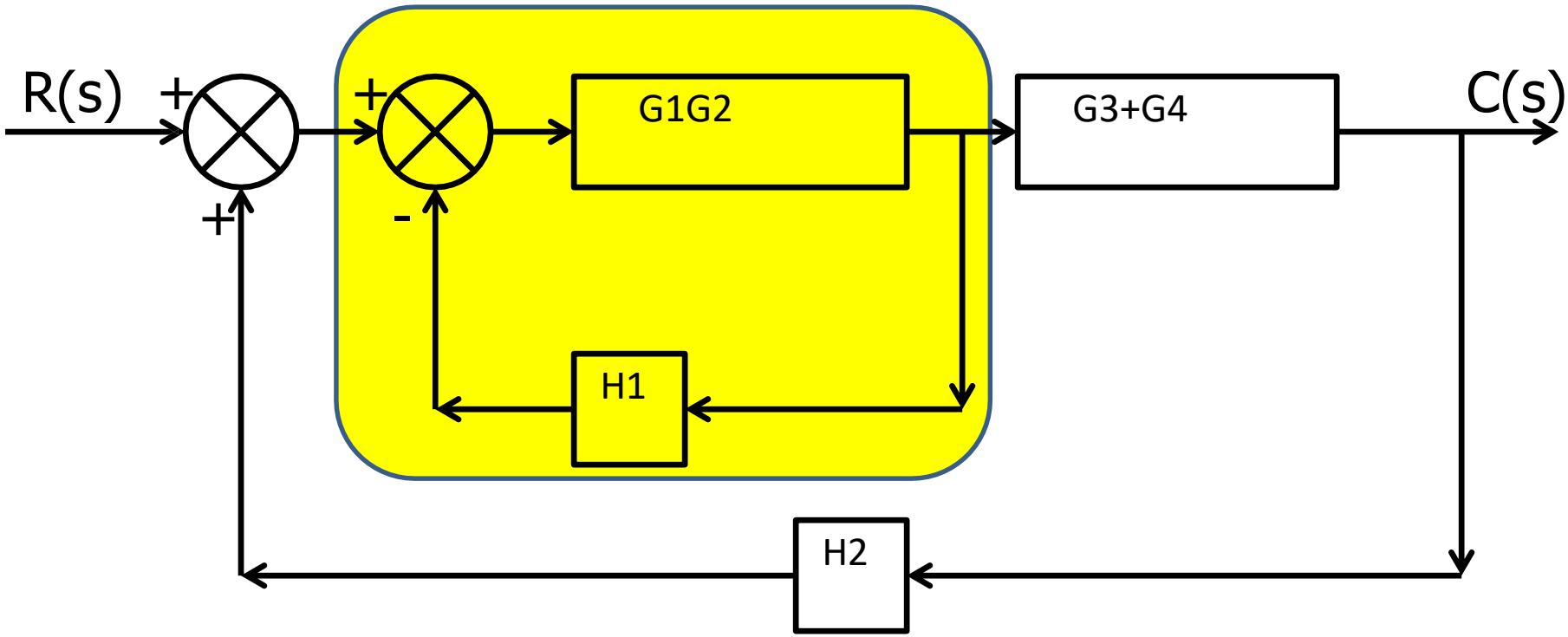
Example 2 cont….

Apply Rule 2
Blocks in parallel



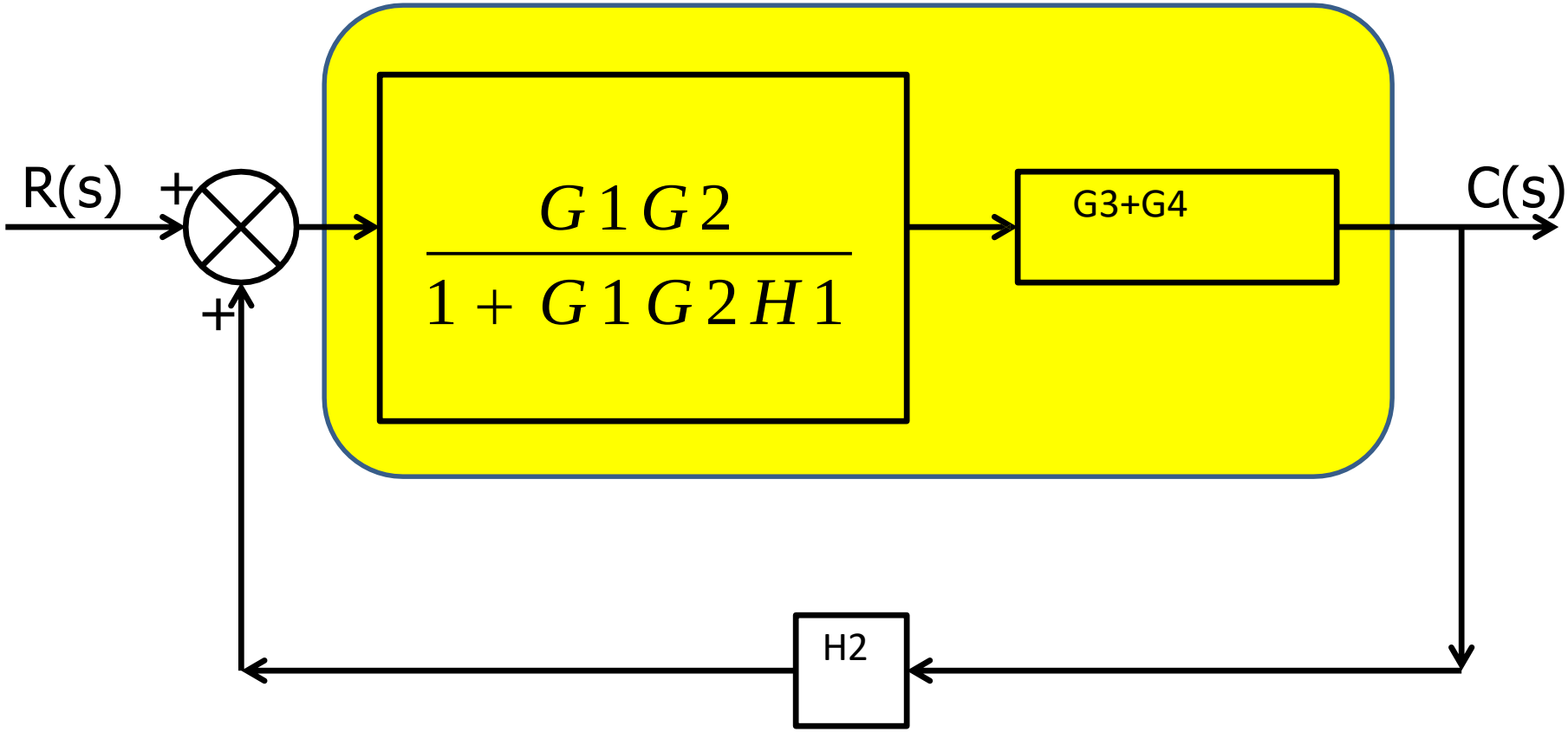
Example 2 cont….

Apply Rule 3
Elimination of feedback loop



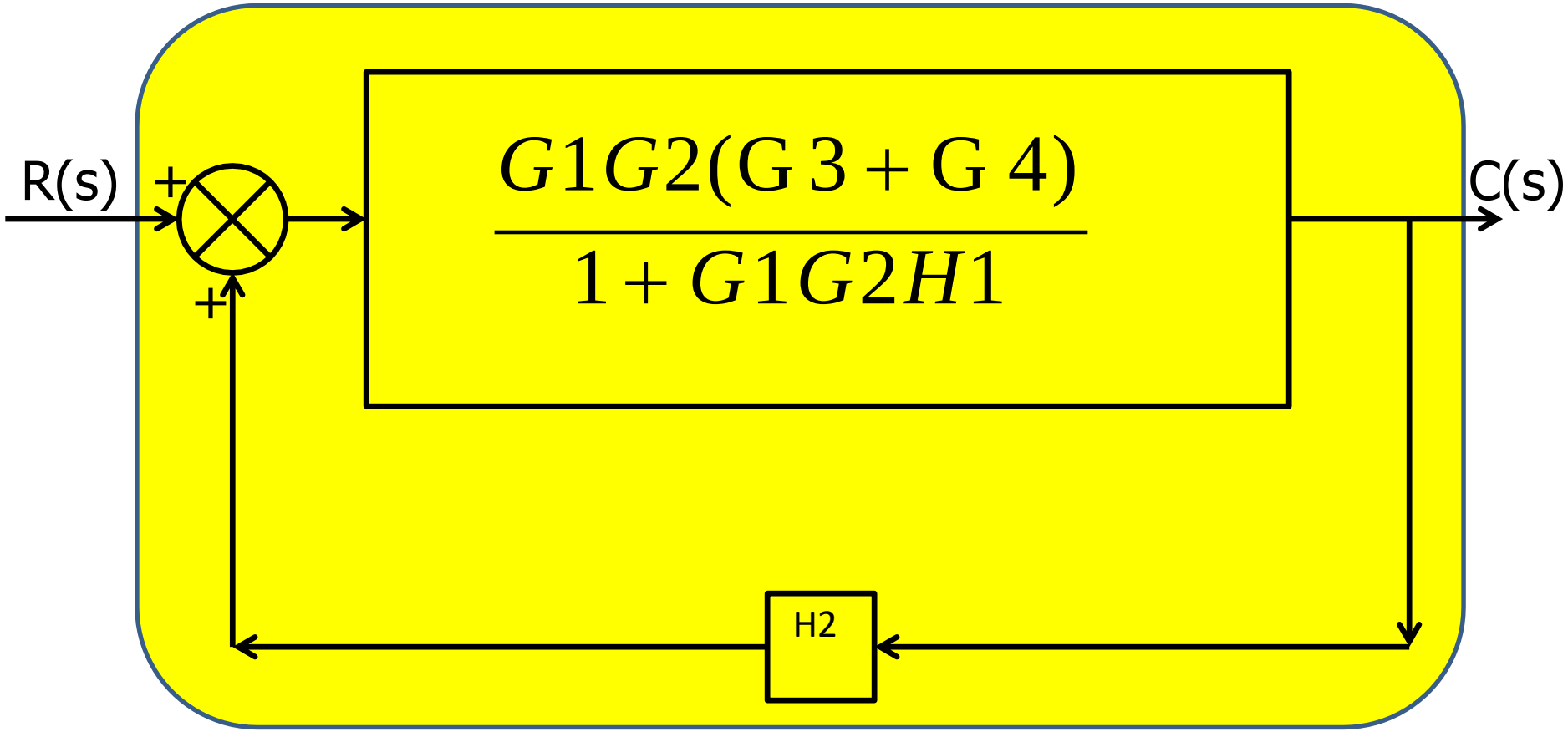
Example 2 cont….

Apply Rule 2 Blocks in series

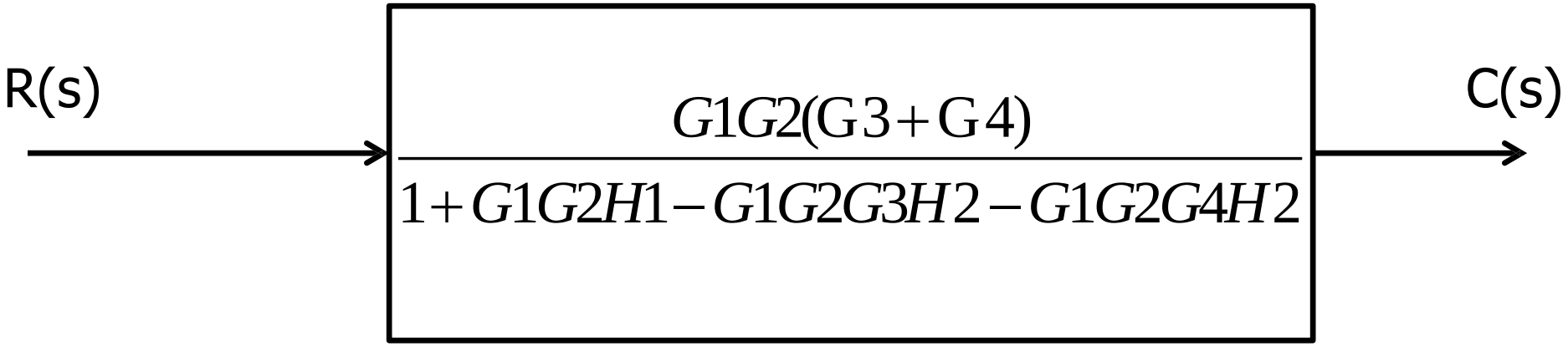


Example 2 cont….

Apply Rule 3 Elimination of feedback loop



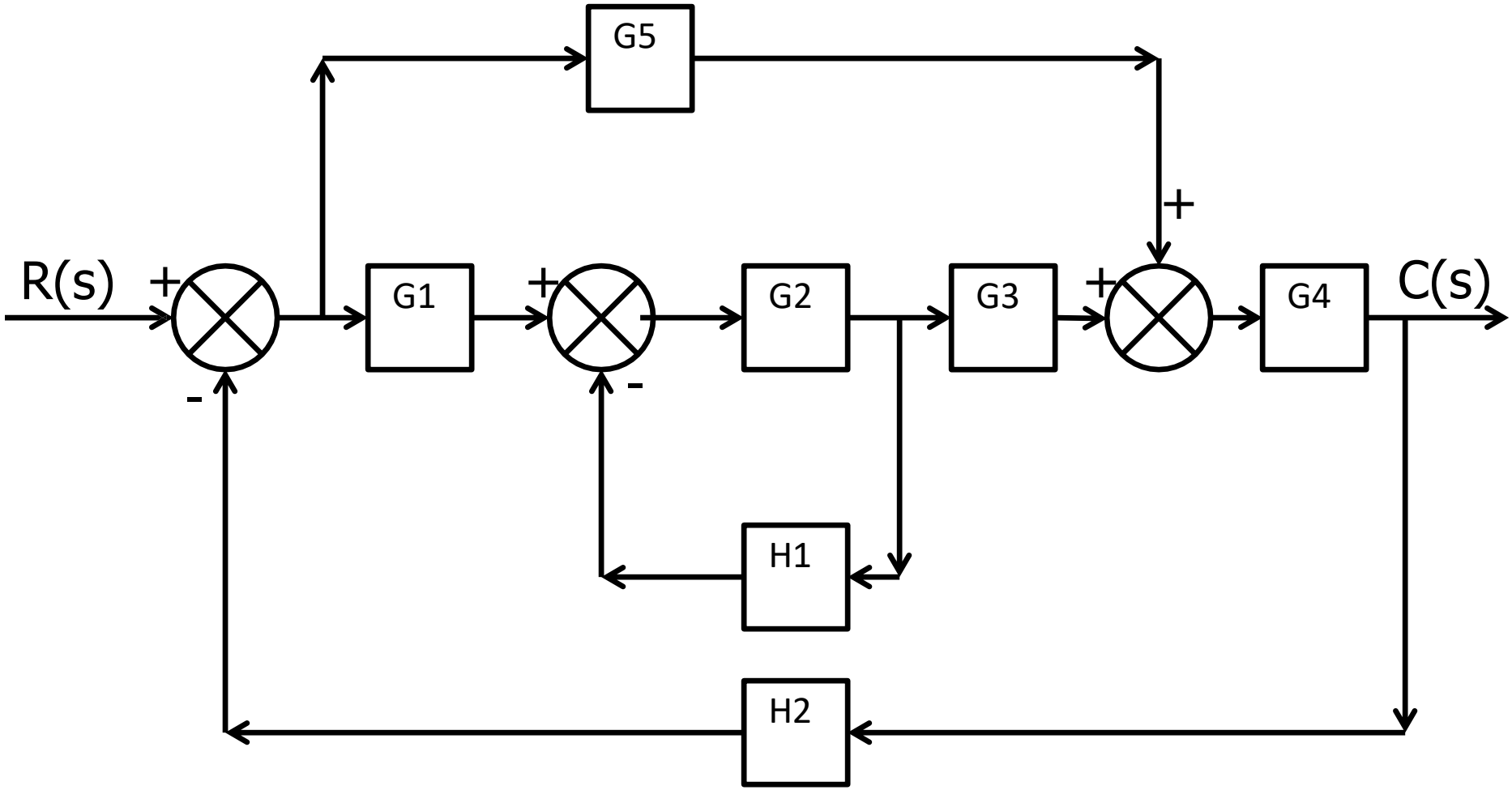
Example 2 cont….



Example 2 cont….

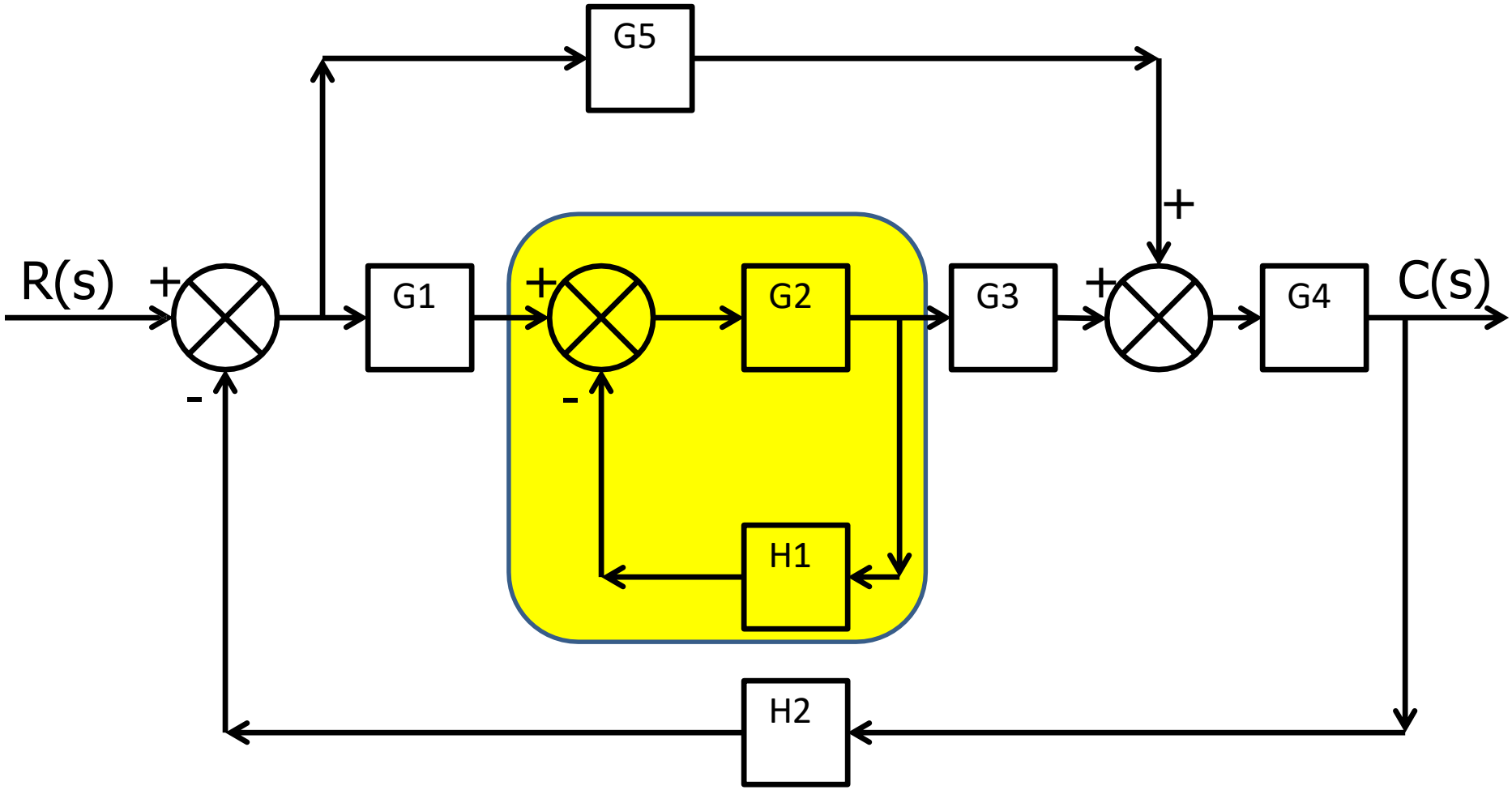
$$\frac{C(s)}{R(s)} = \frac{G1G2(G3+G4)}{1+G1G2H1-G1G2G3H2-G1G2G4H2}$$

Example 3



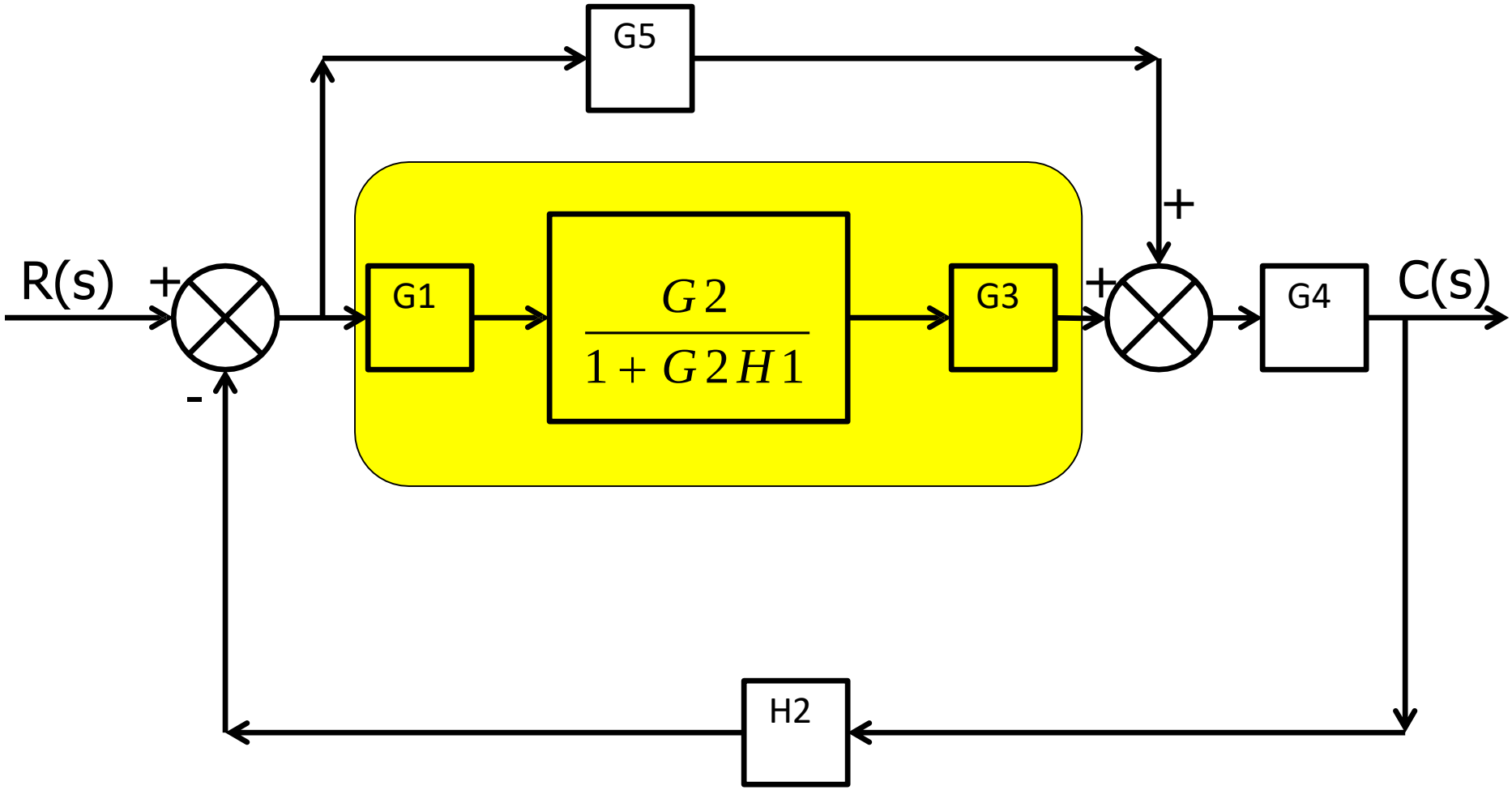
Example 3 cont….

Apply Rule 3 Elimination of feedback loop



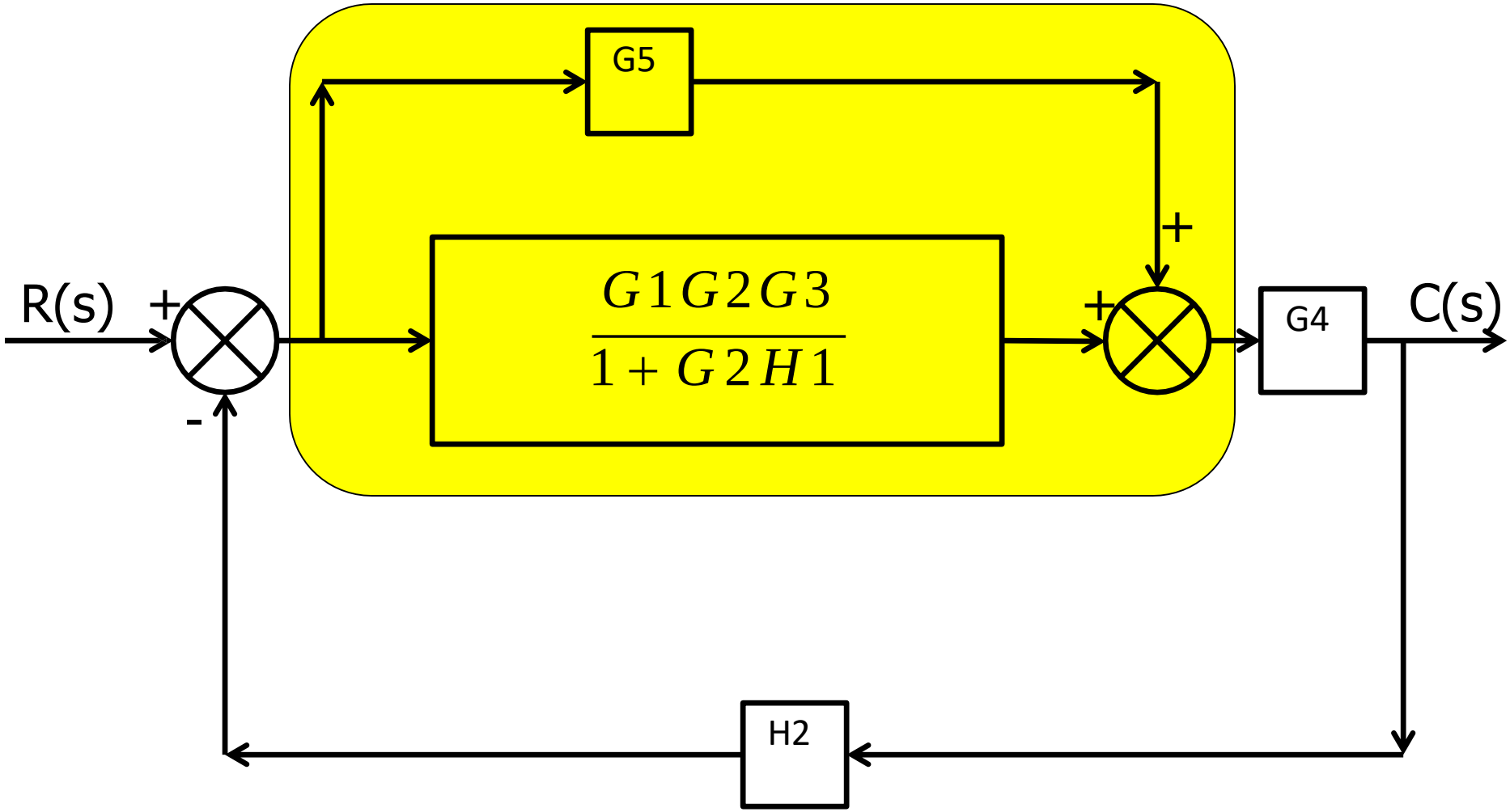
Example 3 cont….

Apply Rule 1 Blocks in series



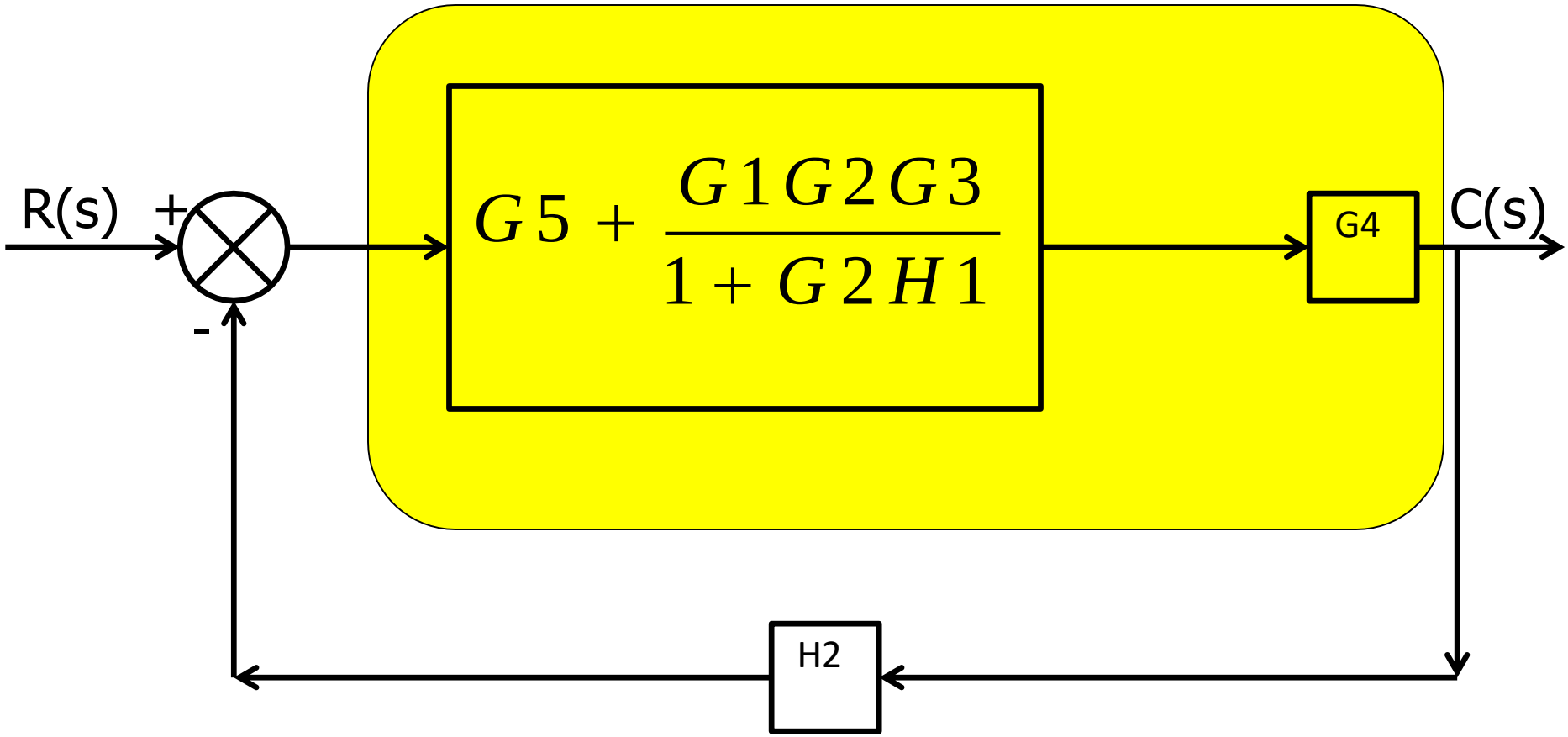
Example 3 cont….

Apply Rule 2 Blocks in parallel



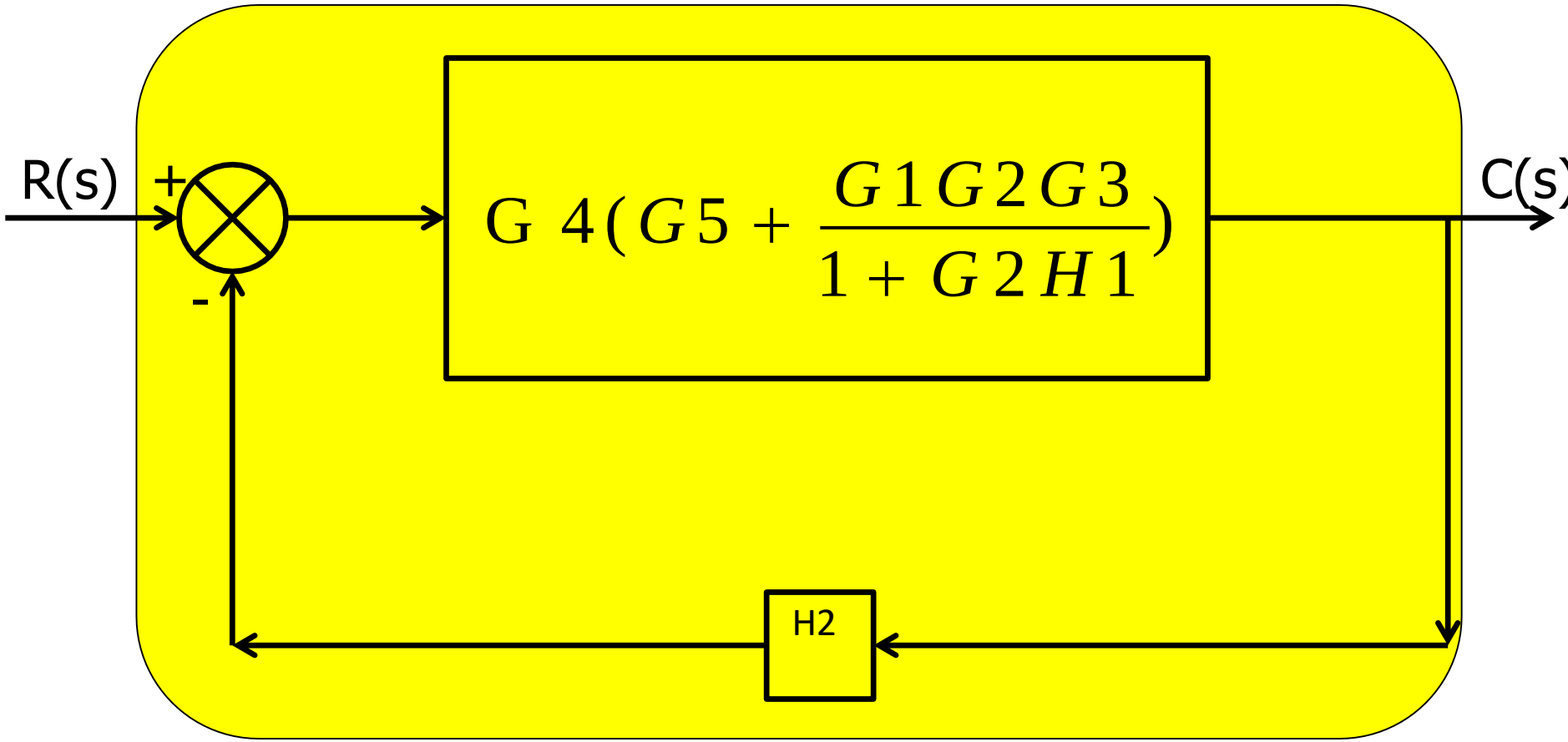
Example 3 cont….

Apply Rule 1 Blocks in series

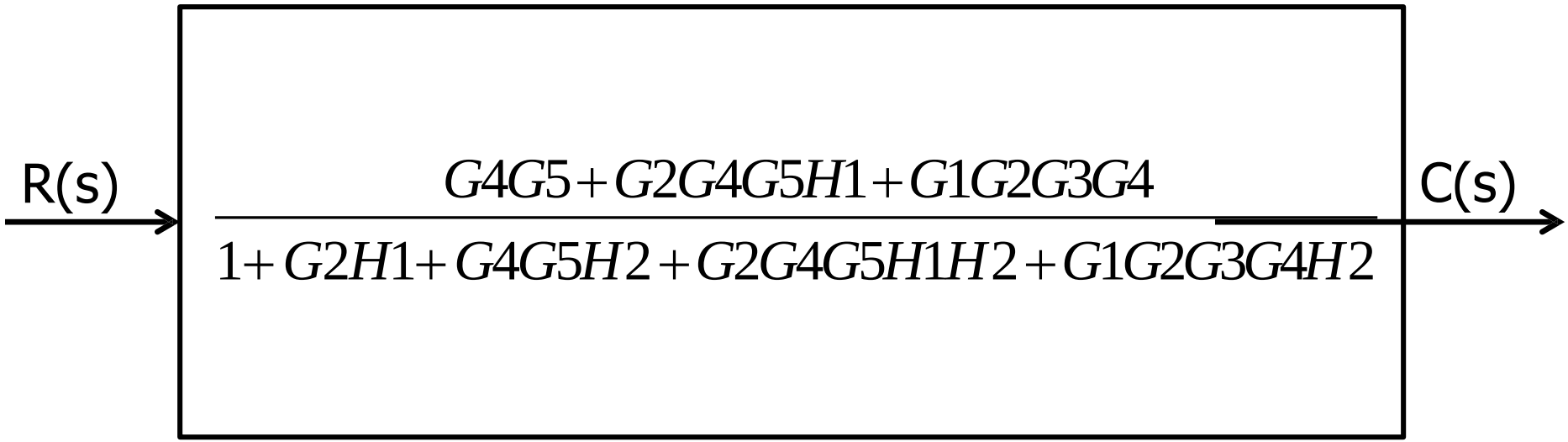


Example 3 cont….

Apply Rule 3 Elimination of feedback loop



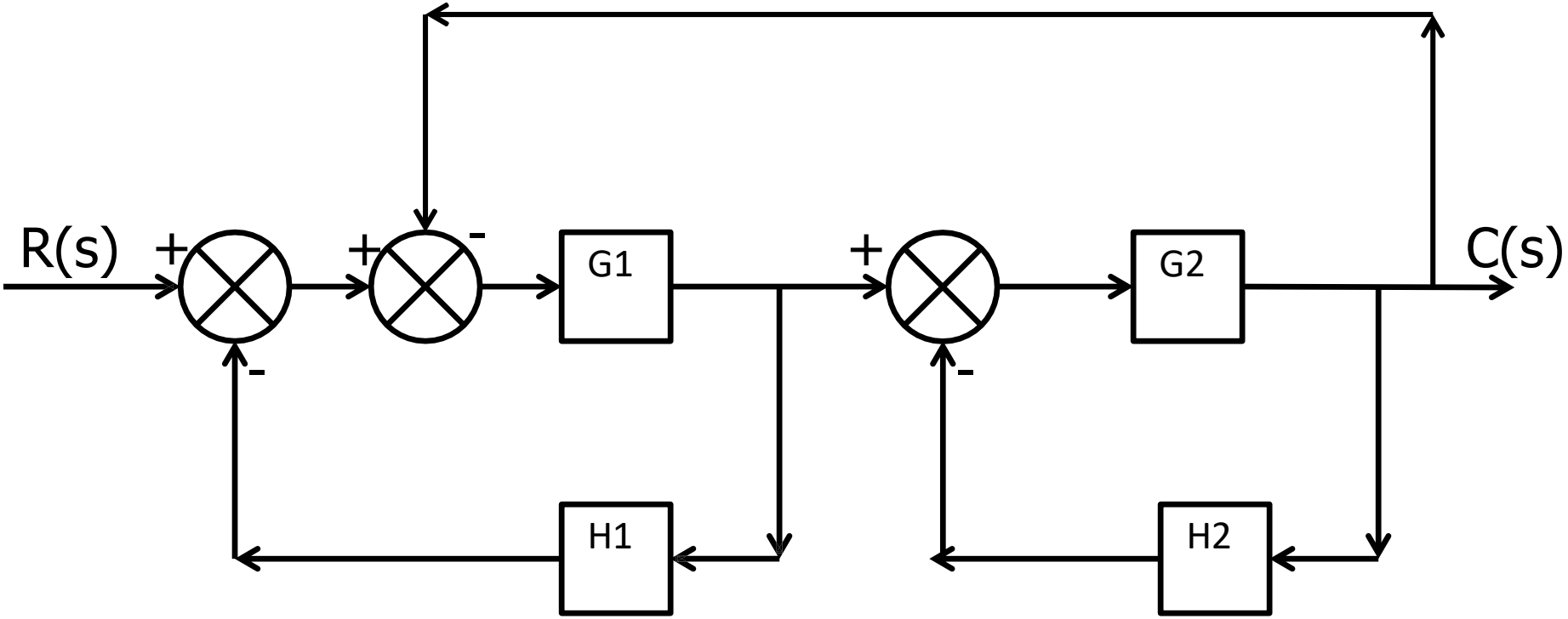
Example 3 cont….



Example 3 cont….

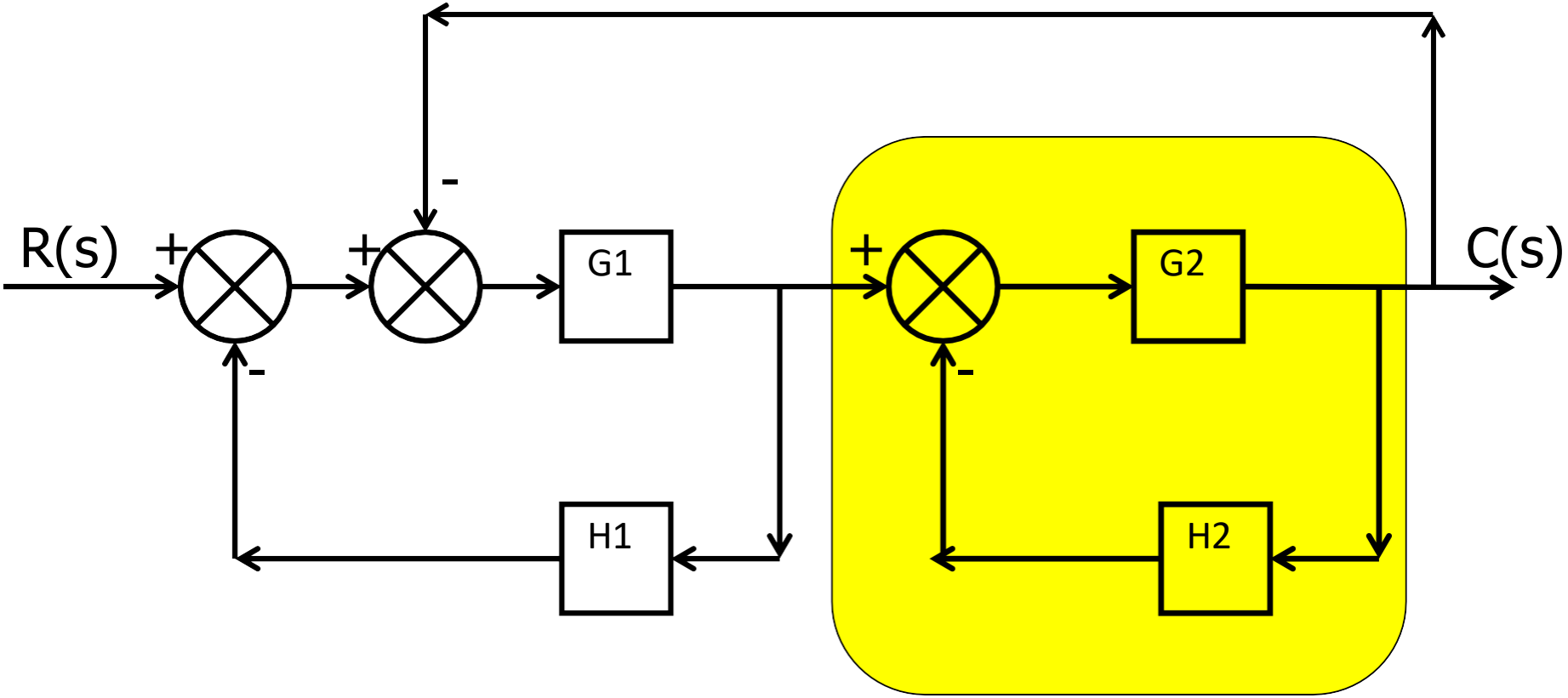
$$\frac{C(s)}{R(s)} = \frac{G4G5 + G2G4G5H1 + G1G2G3G4}{1 + G2H1 + G4G5H2 + G2G4G5H1H2 + G1G2G3G4H2}$$

Example 4

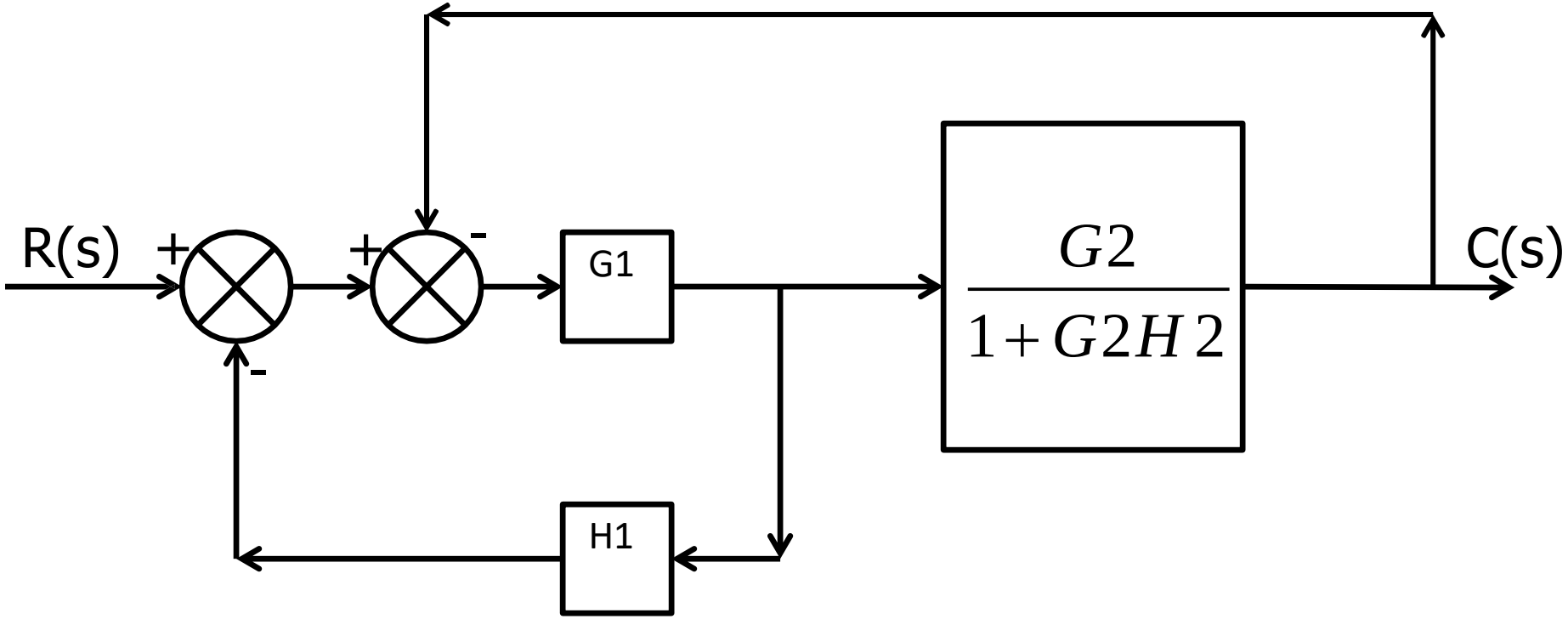


Example 4 cont….

Apply Rule 3 Elimination of feedback loop



Example 4 cont….

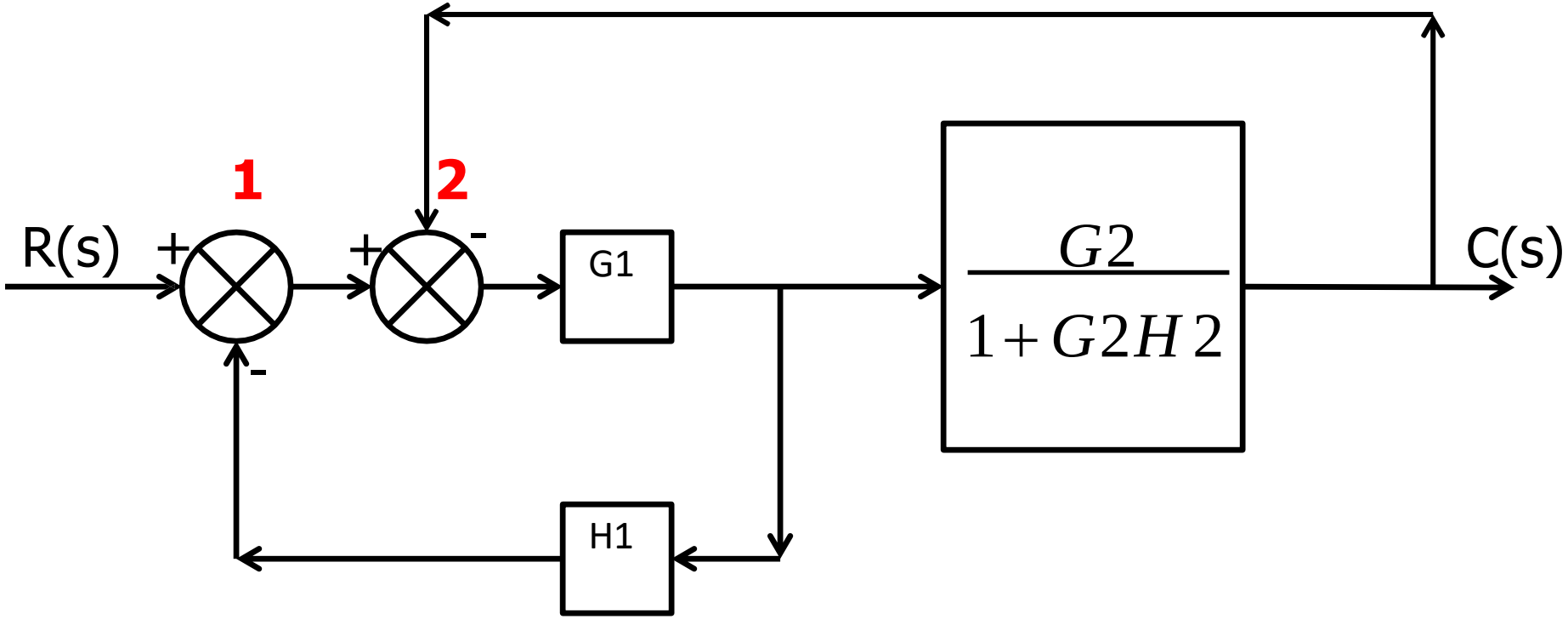


- Now Rule 1, 2 or 3 cannot be used directly.
- There are possible ways of going ahead.
  a. Use Rule 4 & interchange order of summing so that Rule 3 can be used on G.H1 loop.
  b. Shift take off point after $\frac{G\ 2}{1 + G\ 2\ H\ 2}$ block reduce by Rule 1, followed by Rule 3.

Which option we have to use????

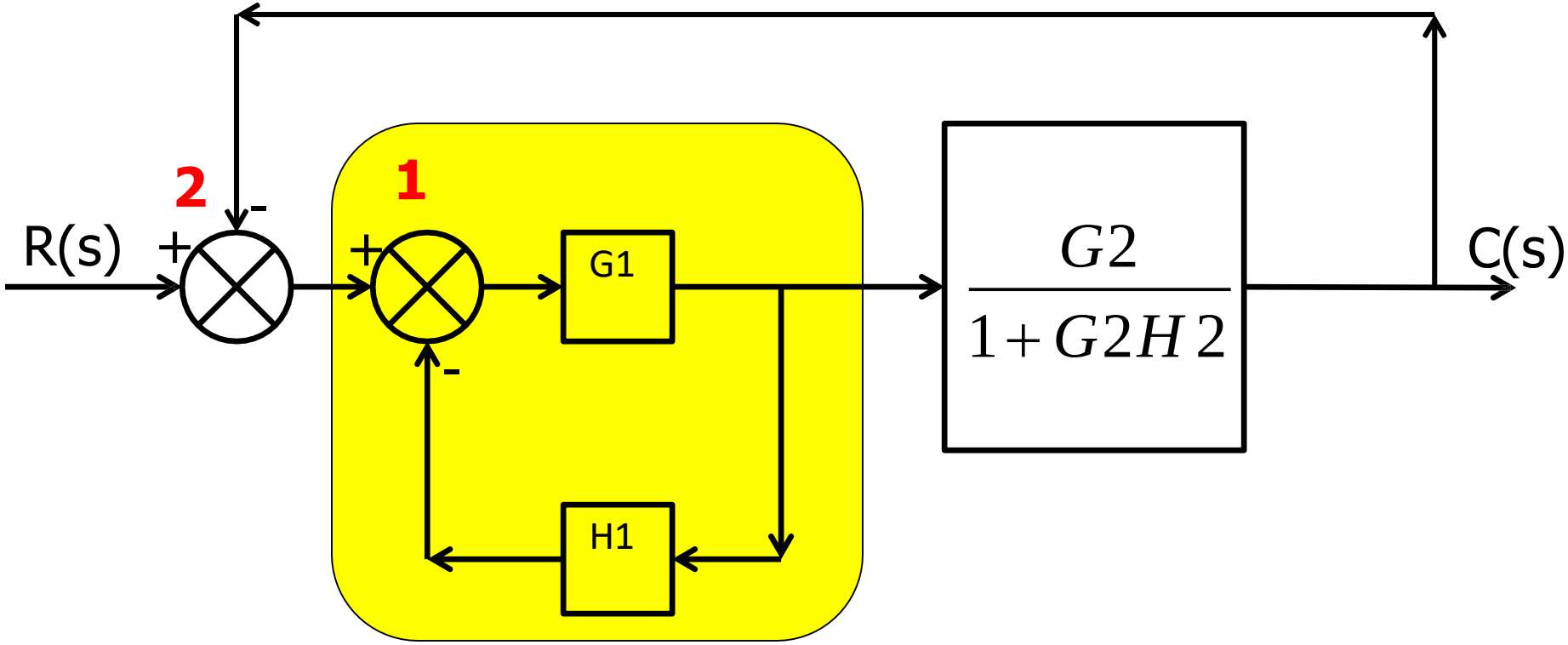
Example 4 cont….

Apply Rule 4 Exchange summing order



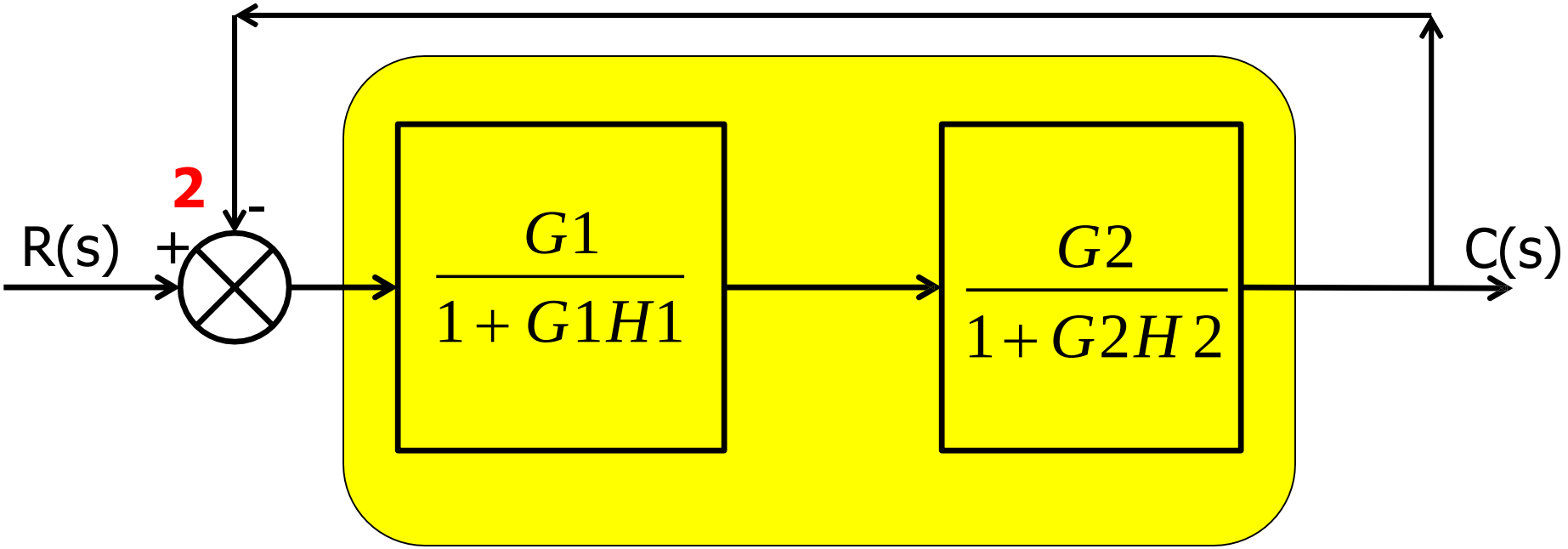
Example 4 cont….

Apply Rule 3 Elimination feedback loop

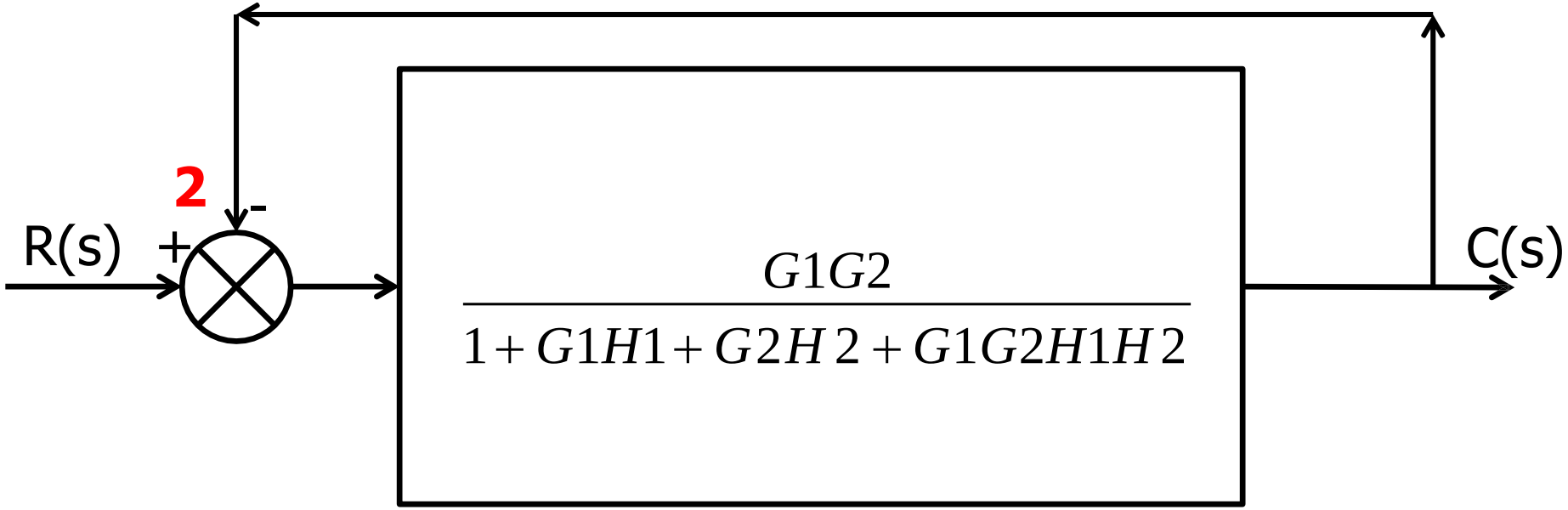


Example 4 cont….

Apply Rule 1 Bocks in series



Example 4 cont....



Now which Rule will be applied

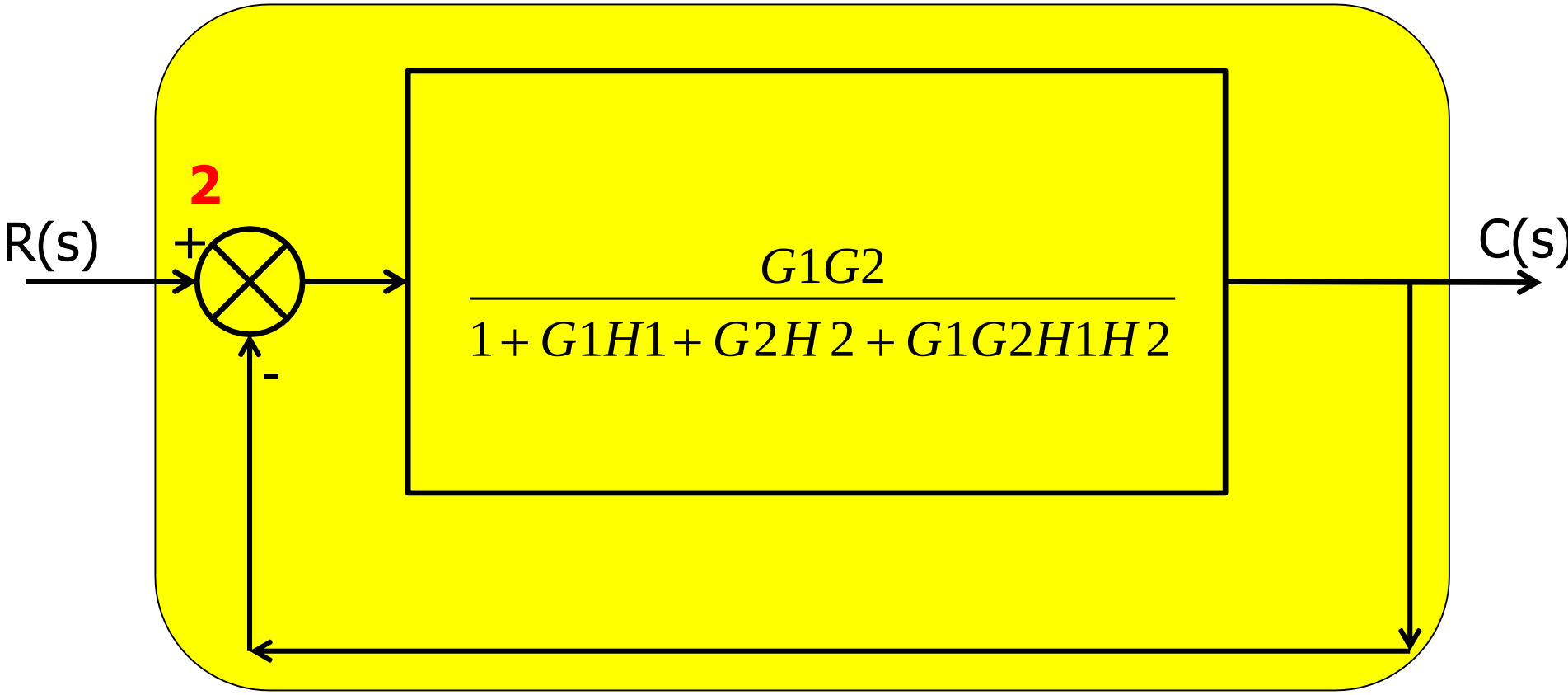
-------It is blocks in parallel **OR**

-------It is feed back loop

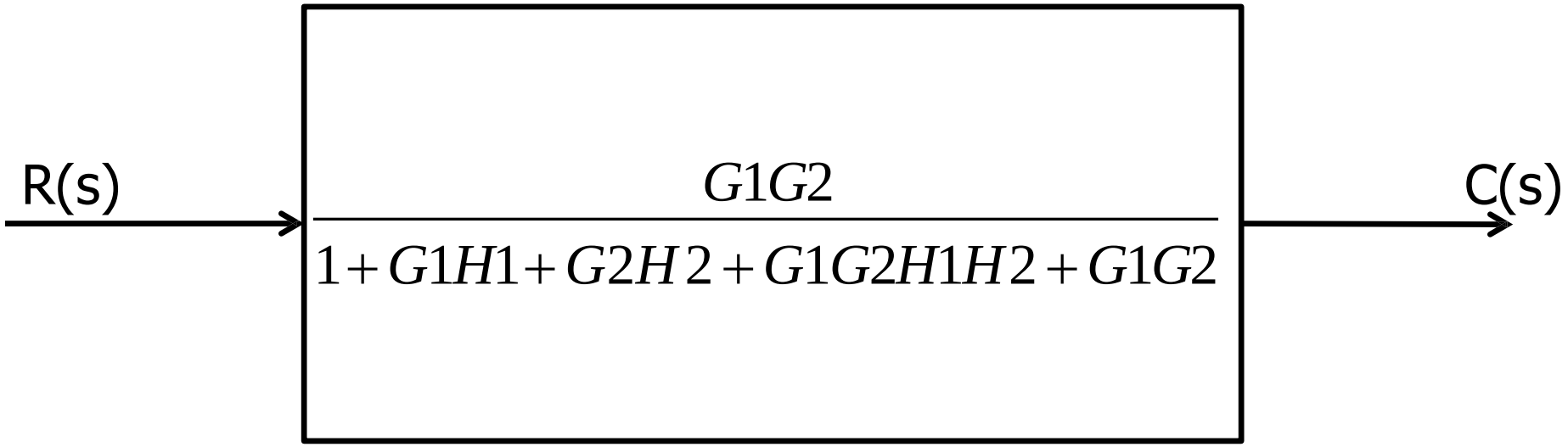
Example 4 cont….

Let us rearrange the block diagram to understand

Apply Rule 3 Elimination of feed back loop



Example 4 cont….

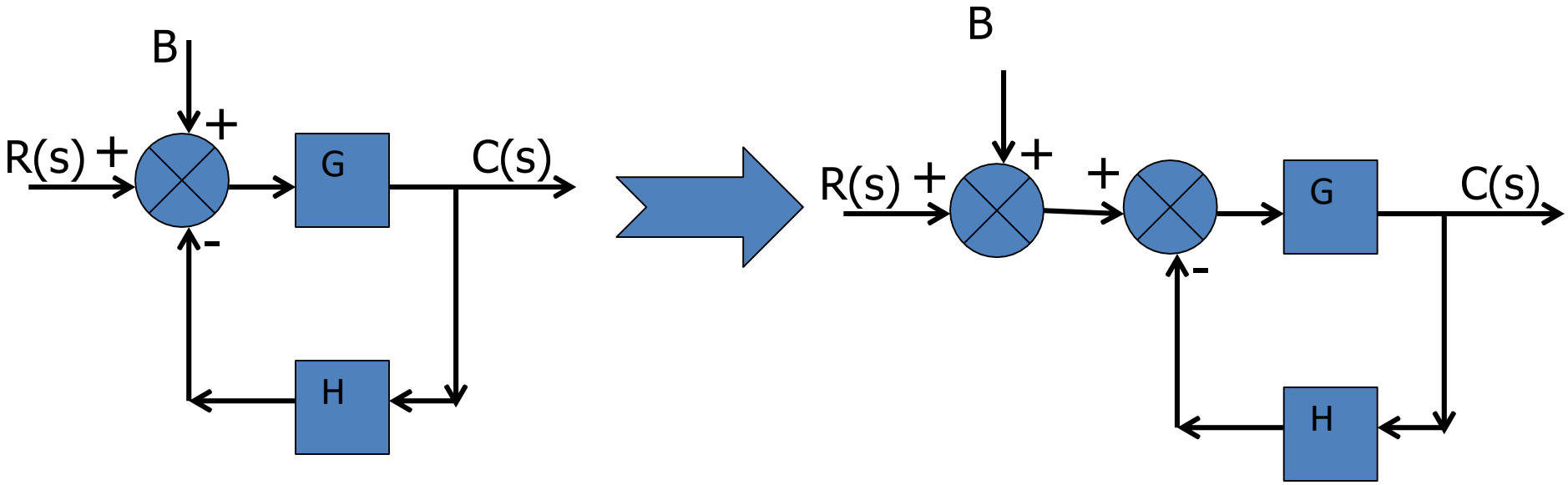


Example 4 cont….

$$\frac{C(s)}{R(s)} = \frac{G1G2}{1 + G1H1 + G2H2 + G1G2H1H2 + G1G2}$$

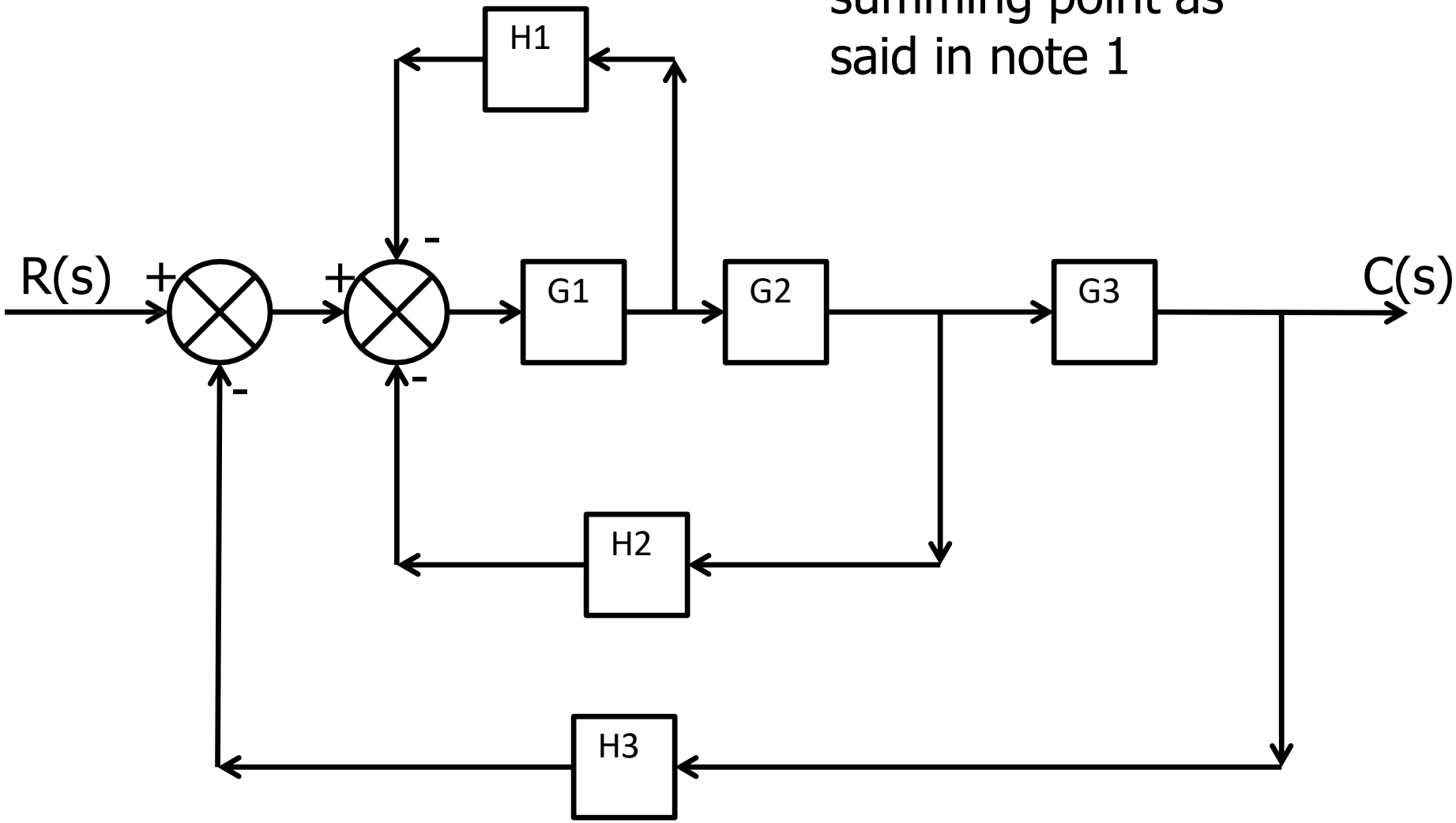
Note 1: According to Rule 4

- By corollary, one can split a summing point to two summing point and sum in any order



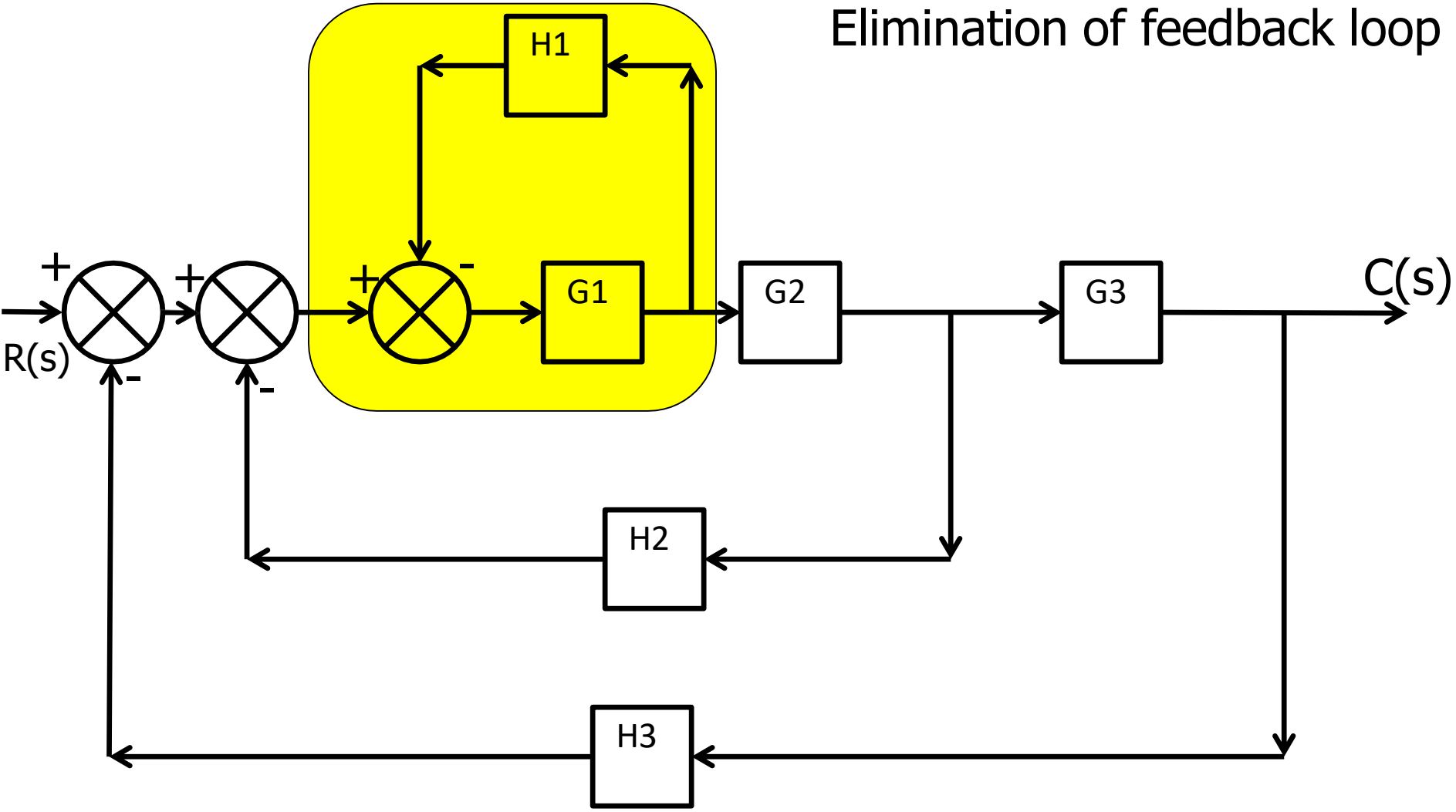
Example 5

Simplify, by splitting second summing point as said in note 1



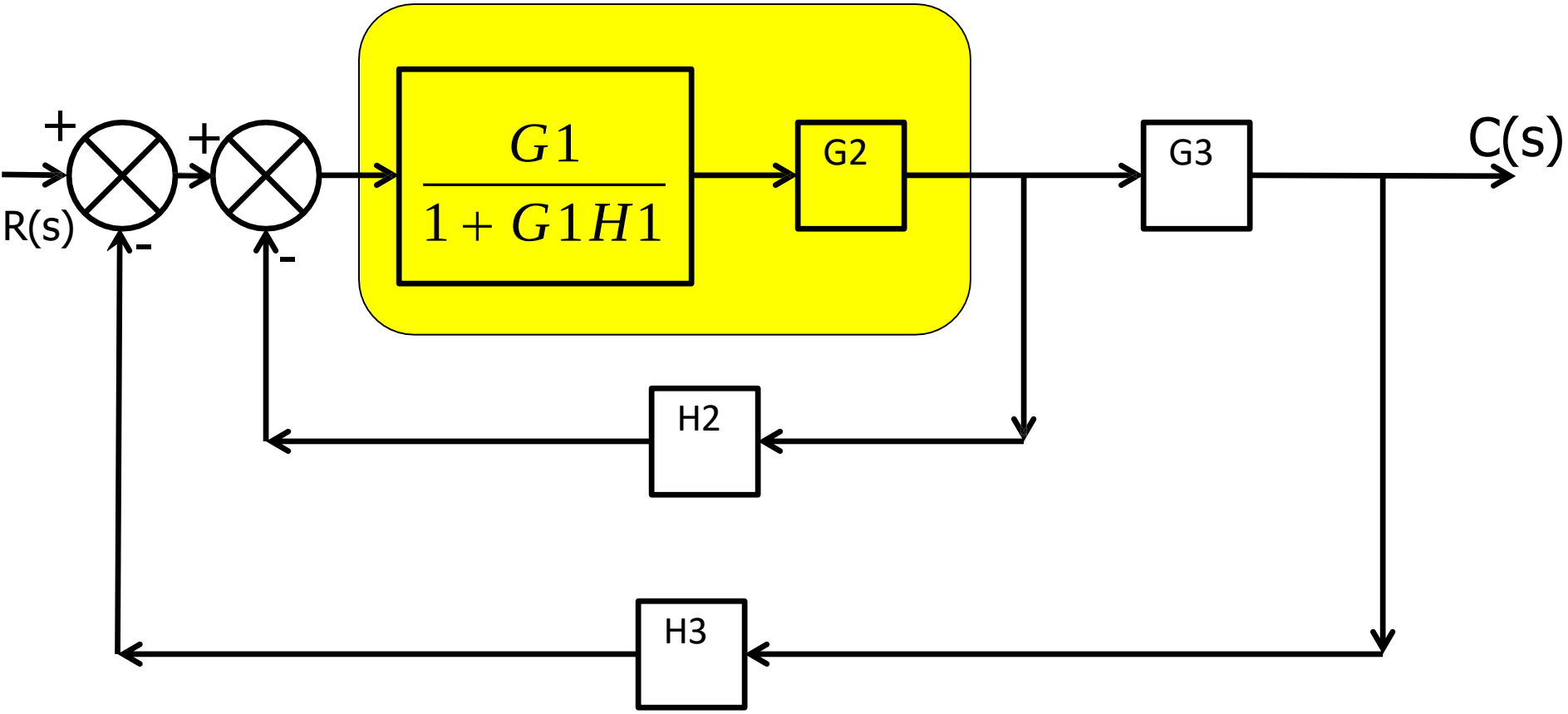
Example 5 cont….

Apply rule 3
Elimination of feedback loop



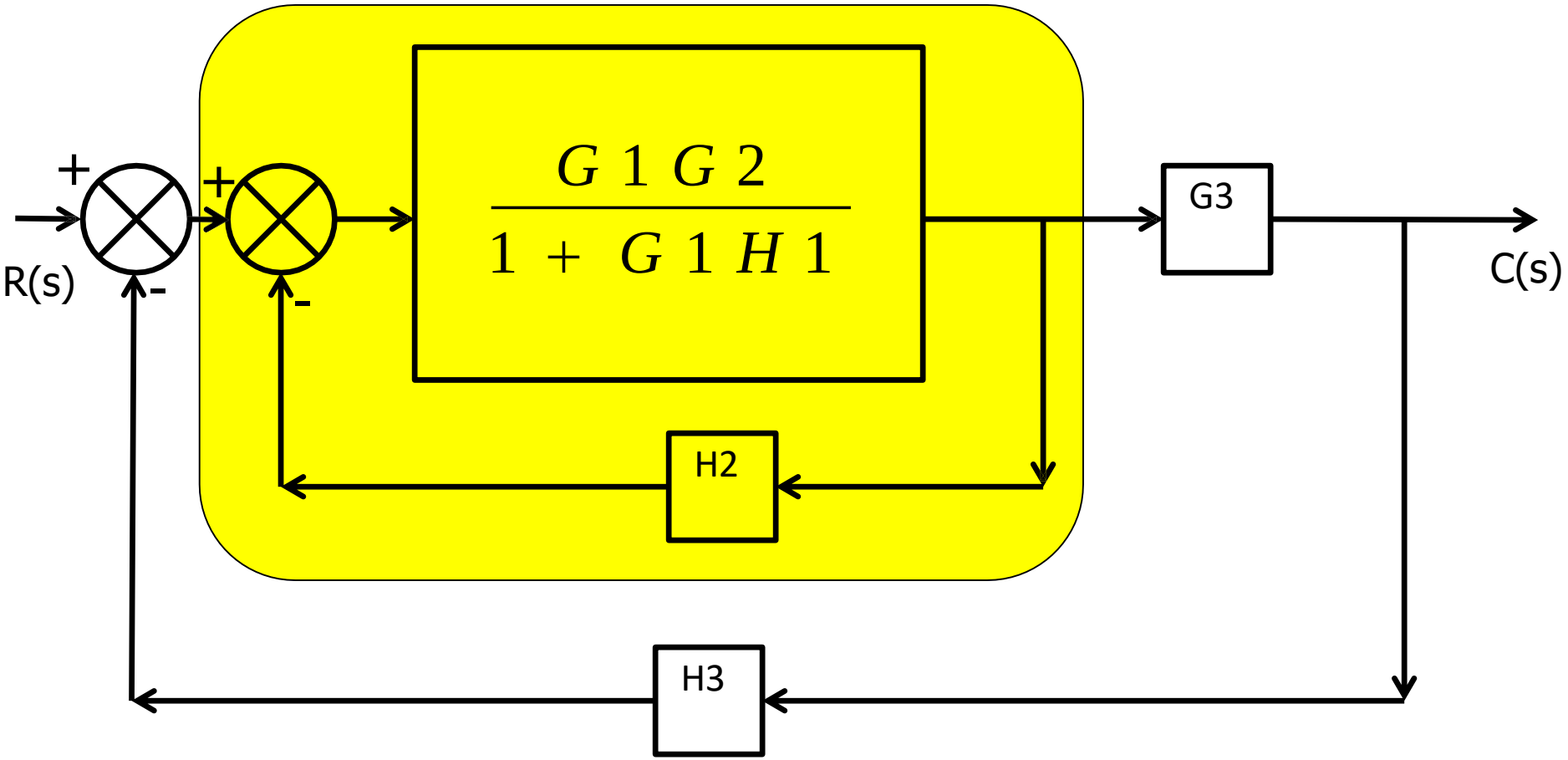
Example 5 cont….

Apply rule 1 Blocks in series



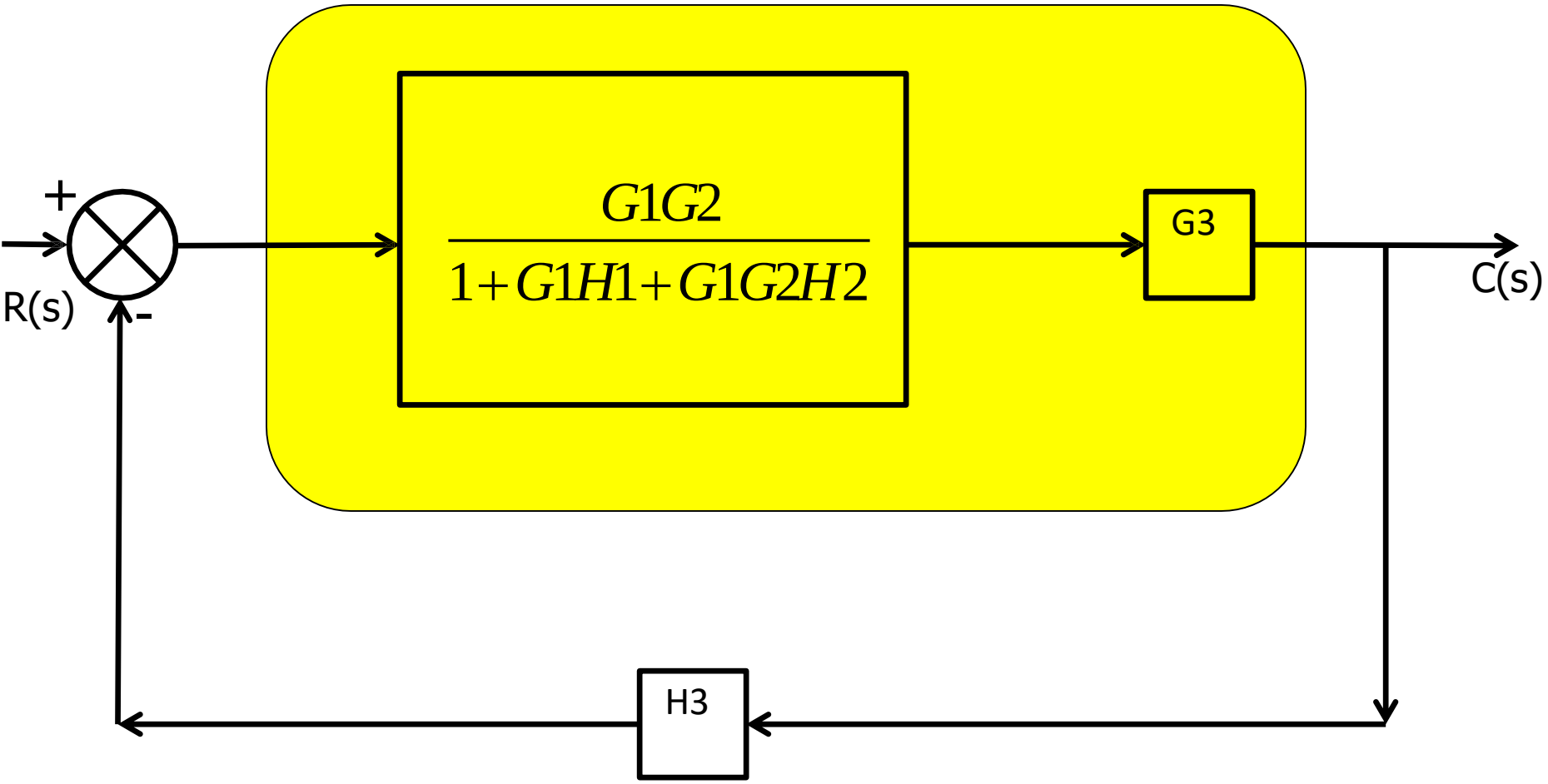
Example 5 cont….

Apply rule 3 Elimination of feedback loop



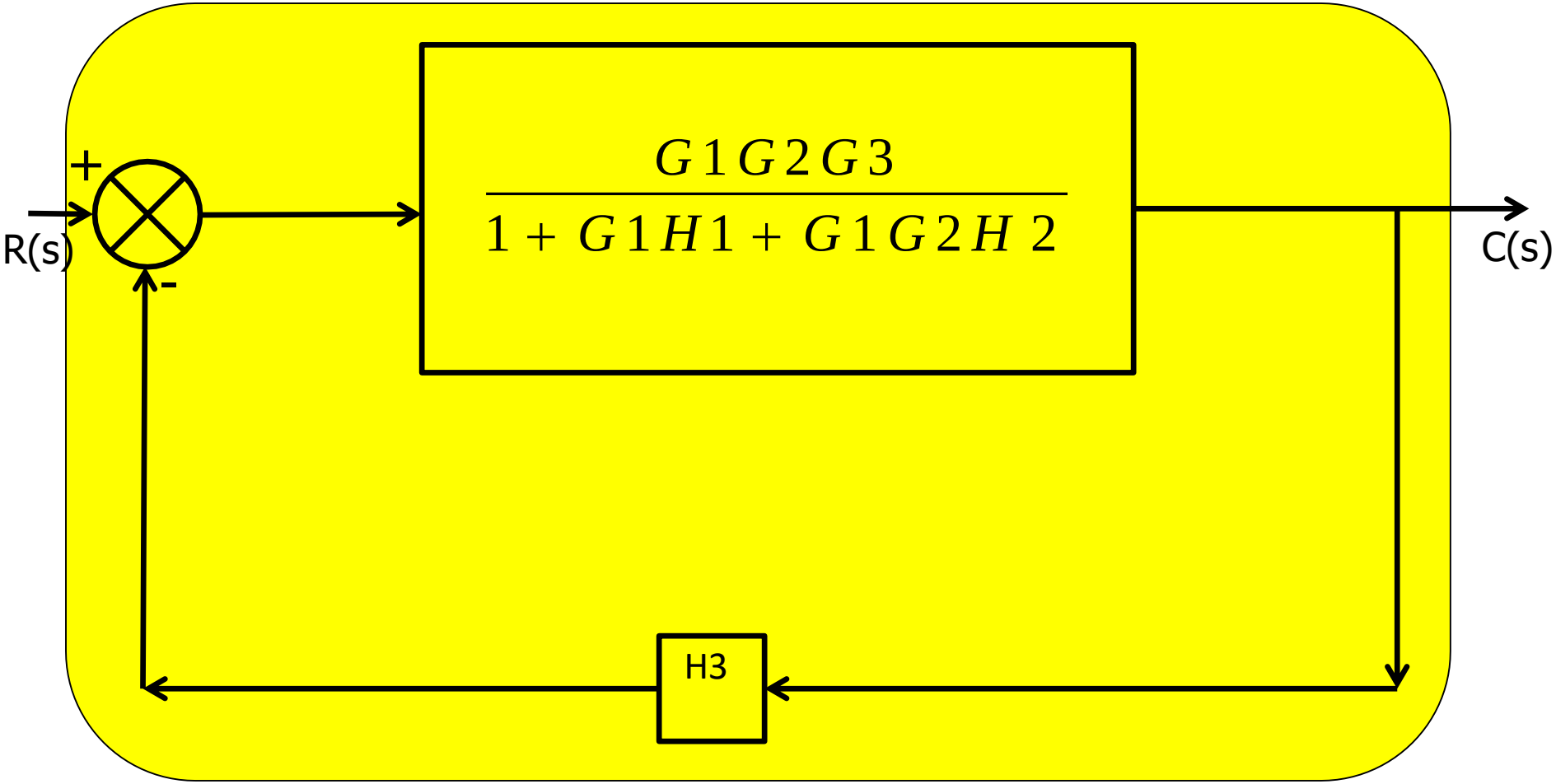
Example 5 cont….

Apply rule 1 Blocks in series

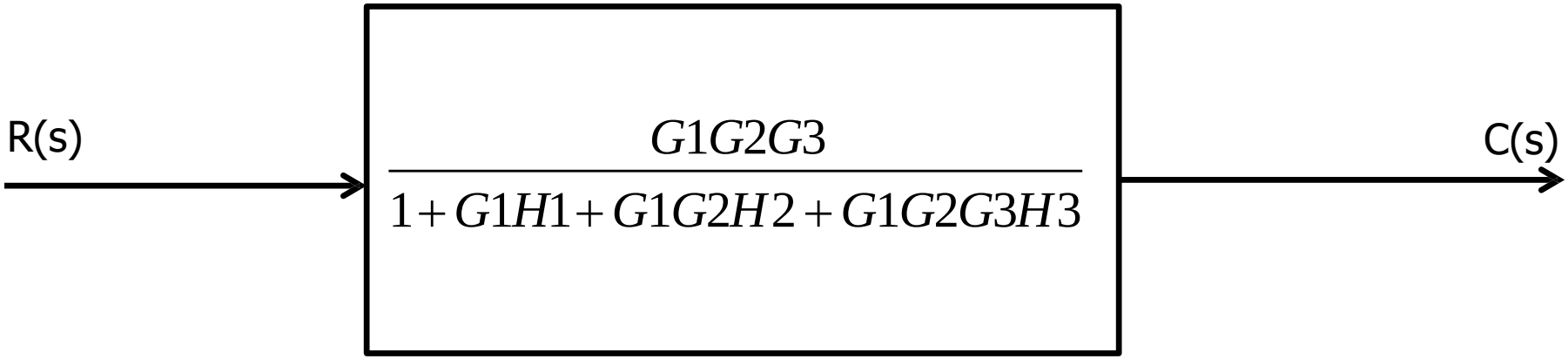


Example 5 cont….

Apply rule 3 Elimination of feedback loop

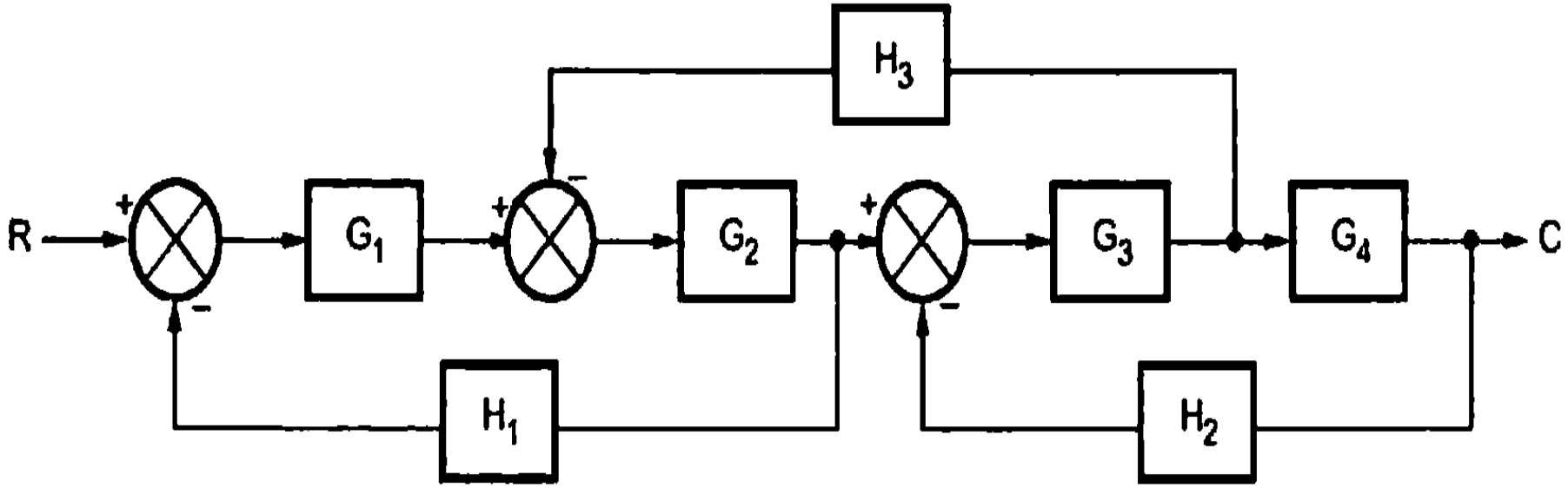


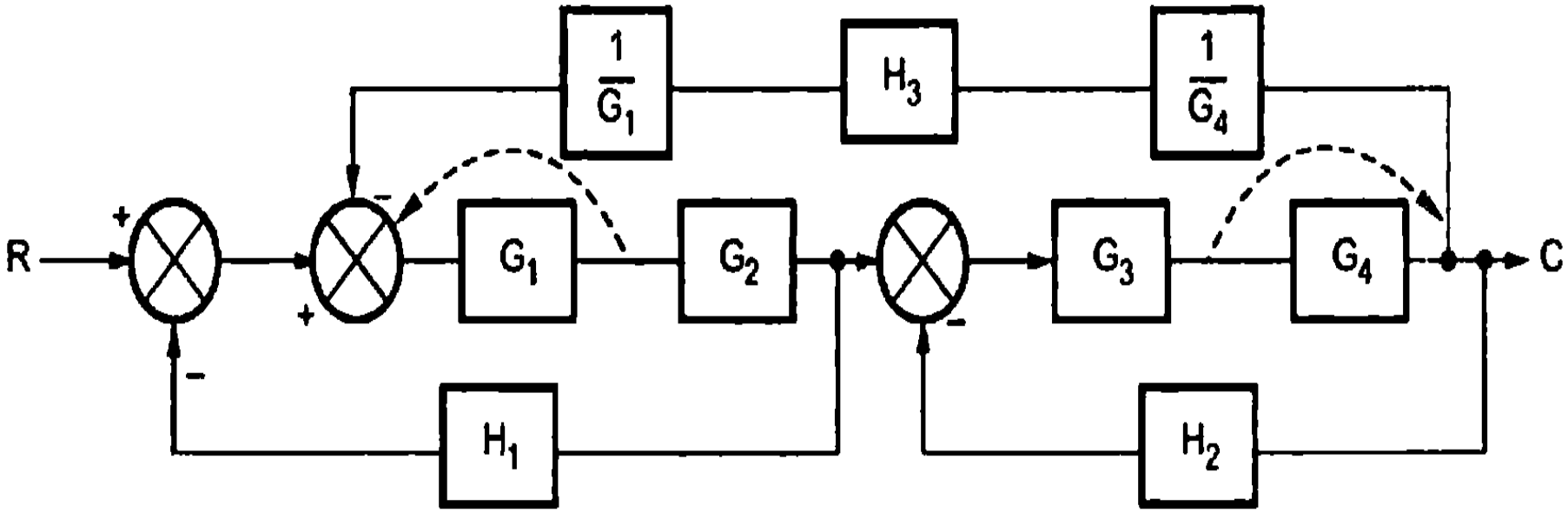
Example 5 cont….



Example 5 cont….

$$\frac{C(s)}{R(s)} = \frac{G1G2G3}{1 + G1H1 + G1G2H2 + G1G2G3H3}$$


R
+
−
G1
+
−
H3
G2
+
−
G3
G4
C
H1
H2


R
+
−
+
−
G_1
G_2
H_1
$\frac{1}{G_1}$
H_3
−
+
−
G_3
G_4
H_2
$\frac{1}{G_4}$
C

Thank You

Anuj Jain