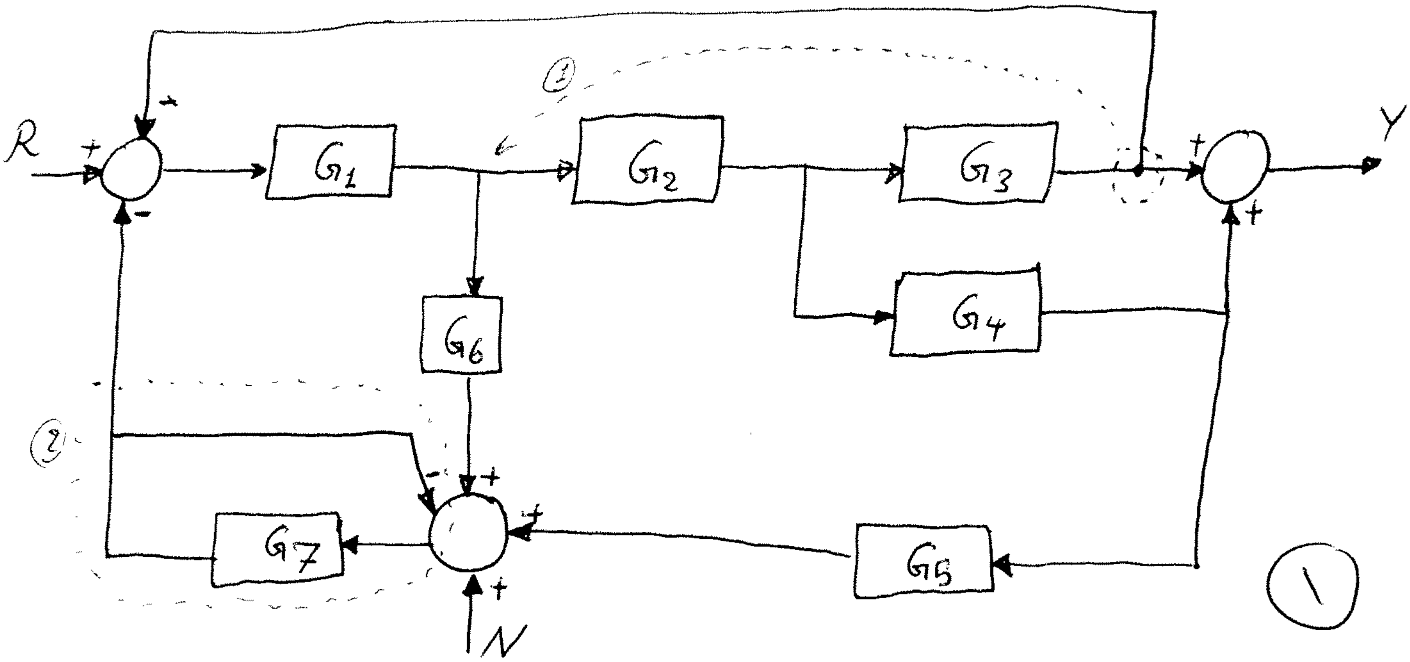
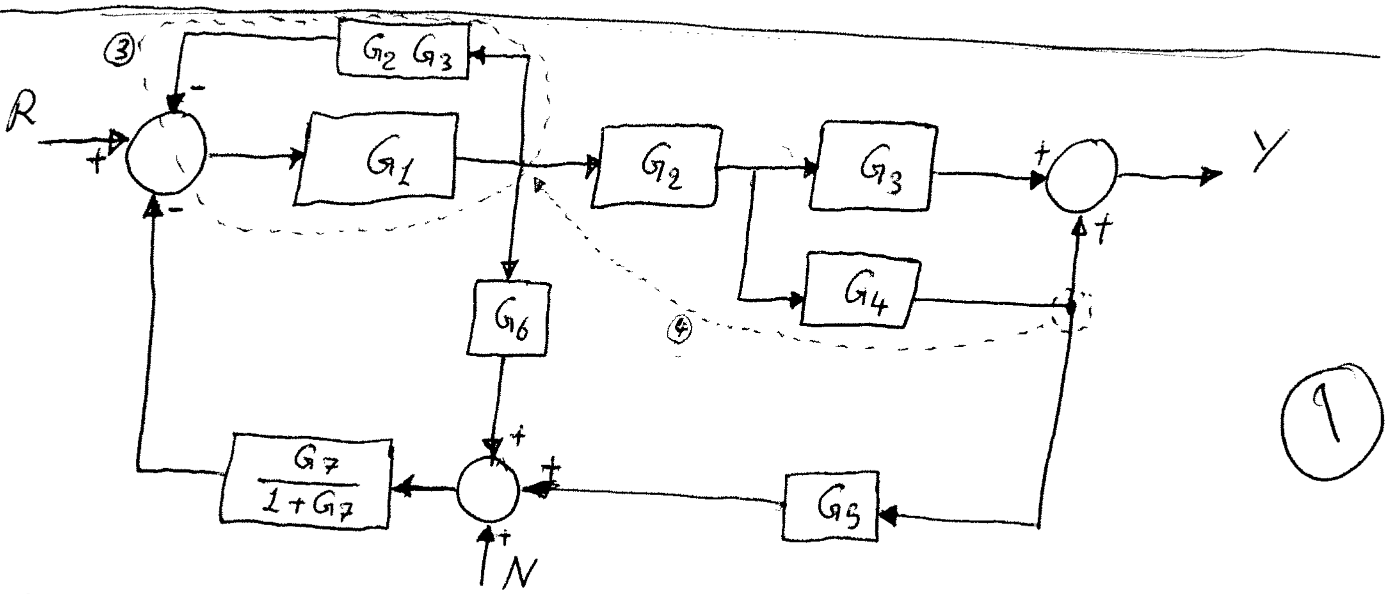


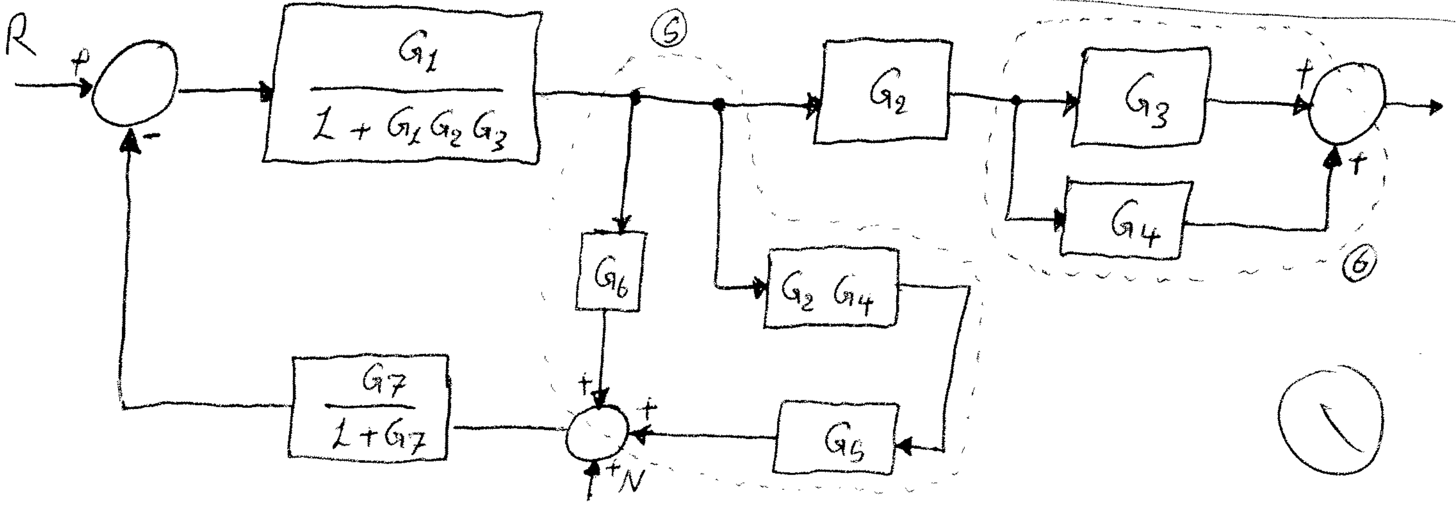
① Moving the take-off-point (from output of G_3 to input of G_2)

② The feed back of (G_7 & (-1))



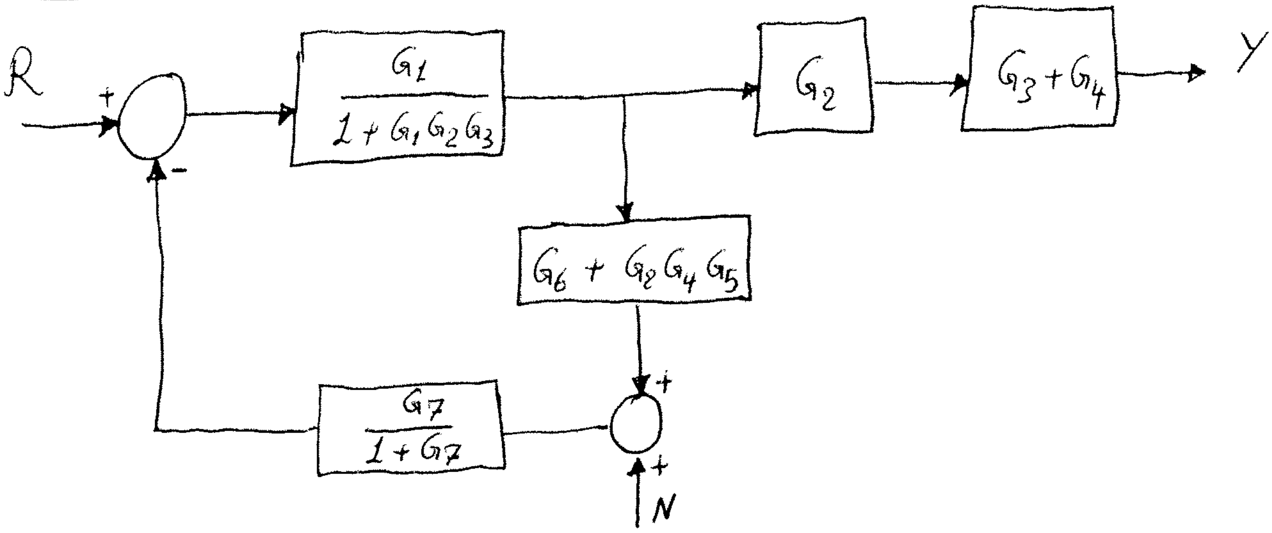
③ The feedback of (G_1 & $(-G_2G_3)$)

④ Moving the take-off-point (from output of G_4 to the input of G_2)



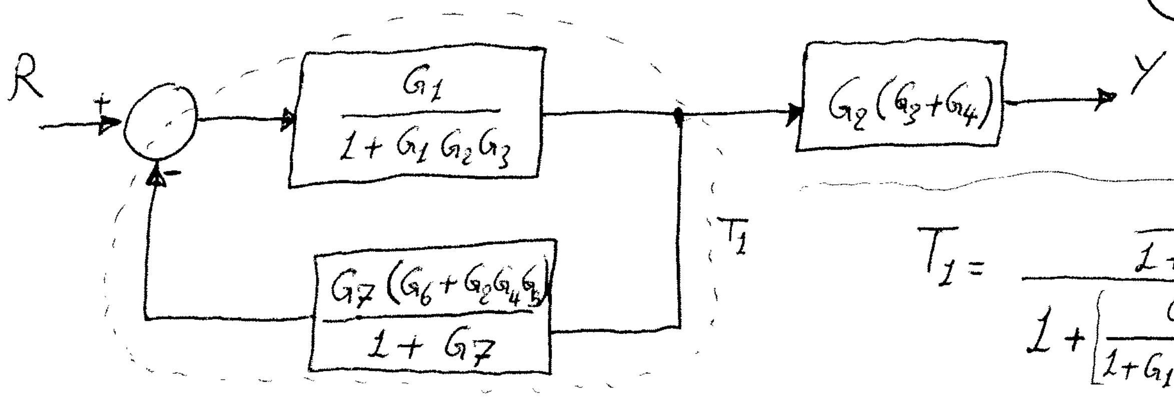
5 G_6 is parallel with $(G_2 G_4 G_5)$

6 G_3 is parallel with G_4



Now we will apply superposition.

First to calculate Y/R, let $N=0$ 1



$$T_1 = \frac{\dfrac{G_1}{1+G_1G_2G_3}}{1+\left[\dfrac{G_1}{1+G_1G_2G_3}\cdot\dfrac{G_7(G_6+G_2G_4G_5)}{1+G_7}\right]}$$

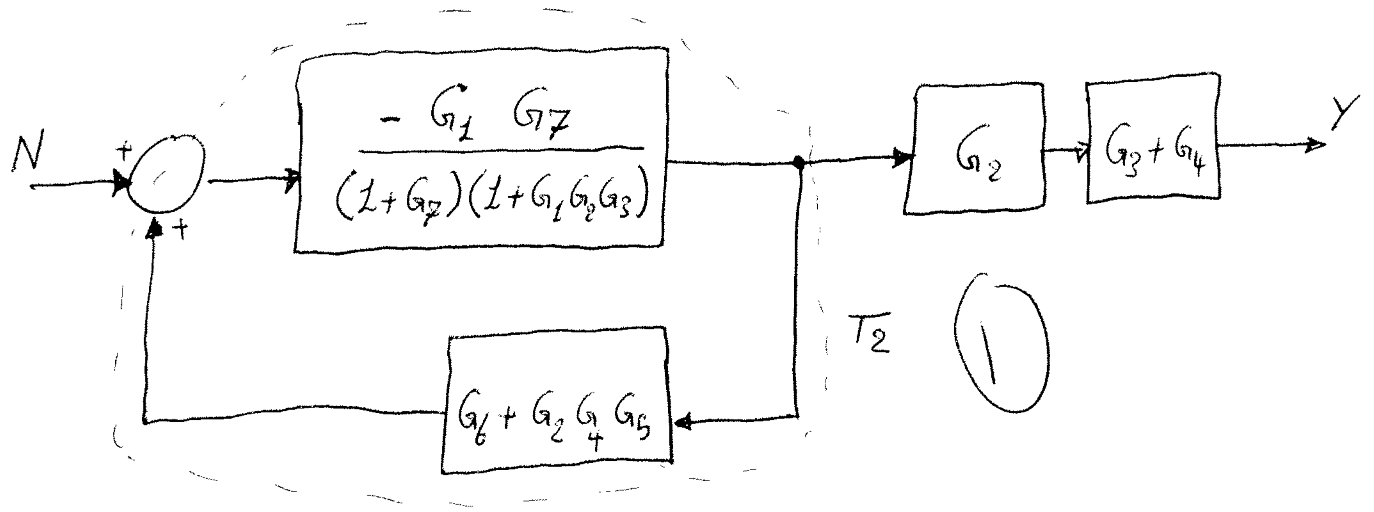
$$\cancel{T_1 = \frac{G_1(1+G_7)}{(1+G_7)(1+G_1G_2G_3)+G_1G_7(G_6+G_2G_4\ldots}}$$

$$T_1 = \frac{G_1\,(1+G_7)}{(1+G_7)(1+G_1G_2G_3)+G_1G_7(G_6+G_2G_4G_5)}$$

$$\boxed{Y/R = T_1 \cdot G_2(G_3+G_4) = \frac{G_1G_2\,(G_3+G_4)\,(1+G_7)}{(1+G_7)(1+G_1G_2G_3)+G_1G_7(G_6+G_2G_4G_5)}}$$

1

After that calculate Y/N, let $R=0$



1

$$T_2 = \frac{-G_1 G_7}{(1+G_7)(1+G_1G_2G_3) + G_1G_7(G_6+G_2G_4G_5)}$$

$$Y/N = T_2 \cdot G_2(G_3+G_4)$$

$$\boxed{Y/N = \frac{-G_1G_7G_2(G_3+G_4)}{(1+G_7)(1+G_1G_2G_3)+G_1G_7(G_6+G_2G_4G_5)}}$$

1

☆ Make sure that the denominator of Y/R is the same as the denominator of Y/N, if not there must be something wrong in your calculations.

Is there any relationship between the system blocks that makes Y independent of N? NO

1

Why?

to have $Y/N = 0$ then

either $(G_1 = 0,\ G_2 = 0$ or $G_7 = 0)$, not practical, we need a relation between blocks, not to remove the block completely!

or $G_3 = -G_4$ also not practical ~~as will~~ because it will make both Y/N & Y/R equal to zero