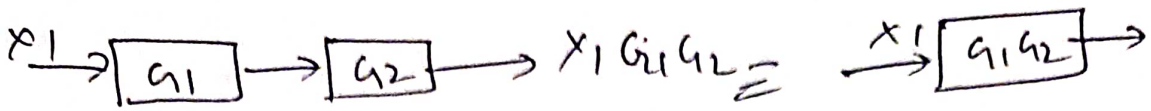
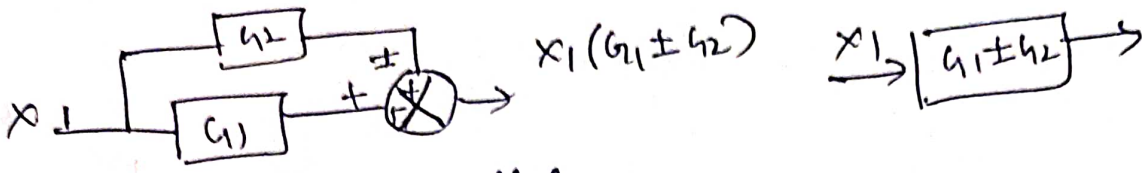
2)

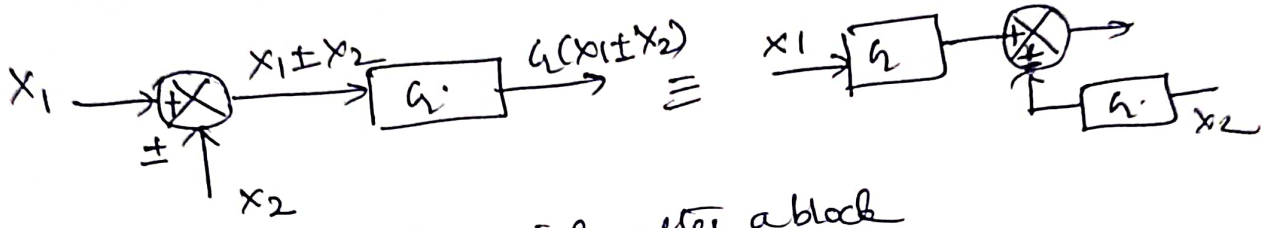
Block diagram reduction technique rules

(1) 

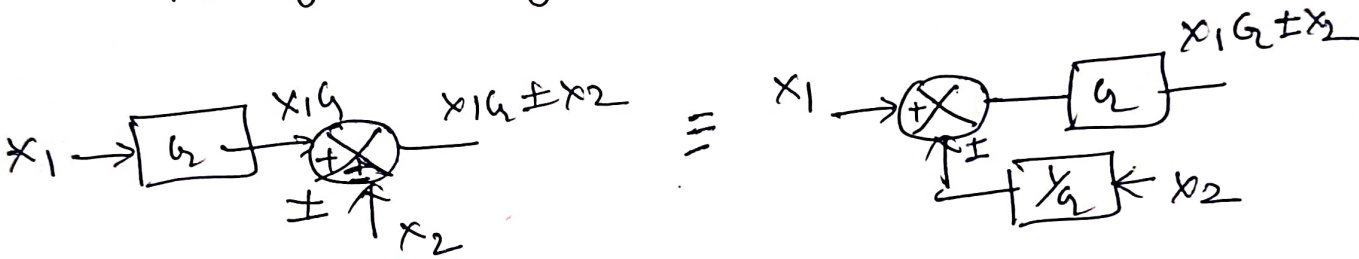
blocks in cascade

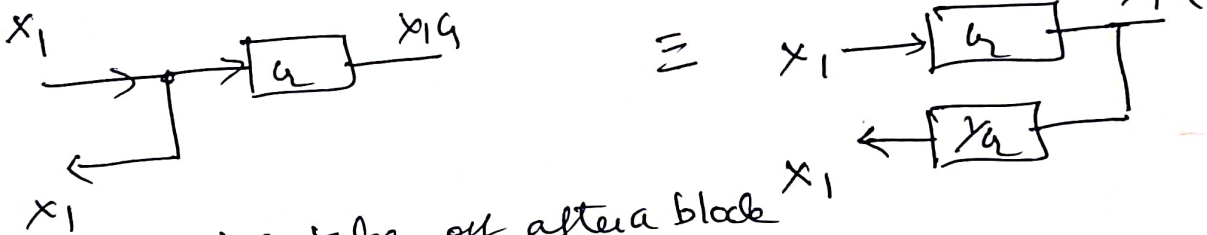
(2) 

Blocks in parallel

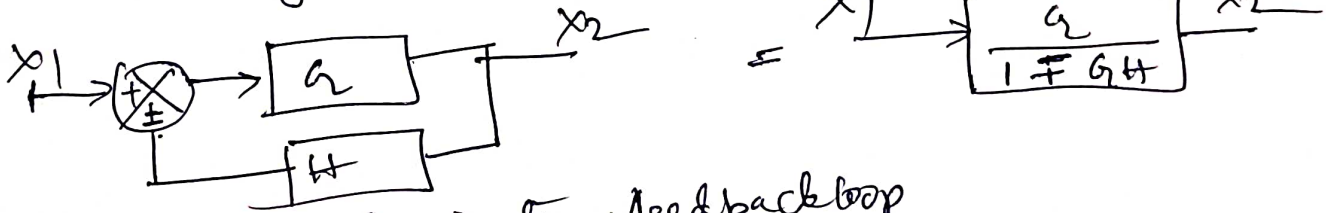
(3) 

Moving summing point after a block

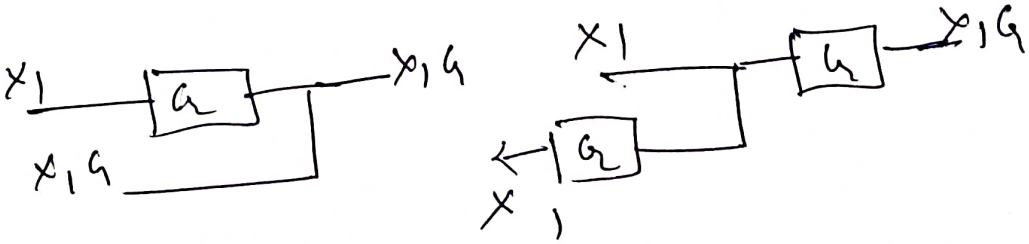
(4) 

(5) 

Moving take off after a block

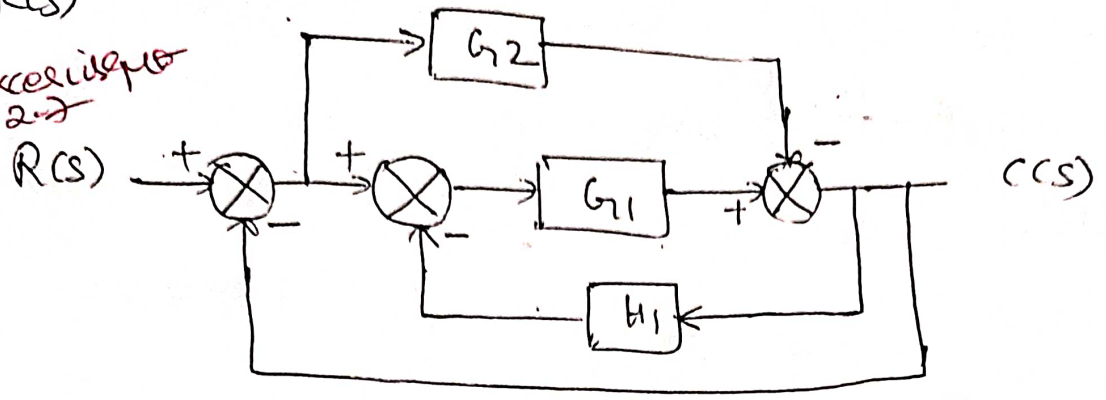
(6) 

Eliminating feedback loop

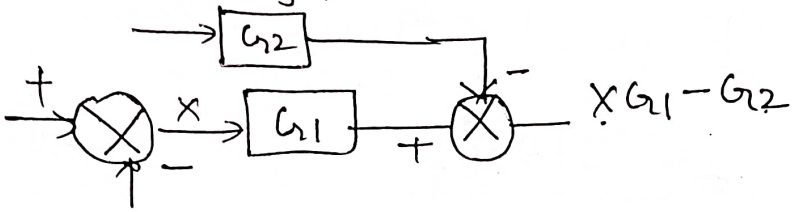
(7) 

Reduce the block diagram shown in fig & find $\frac{C(s)}{R(s)}$

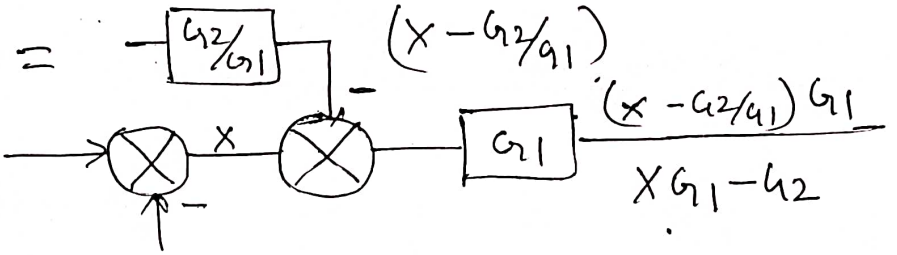
Exercise 2.7

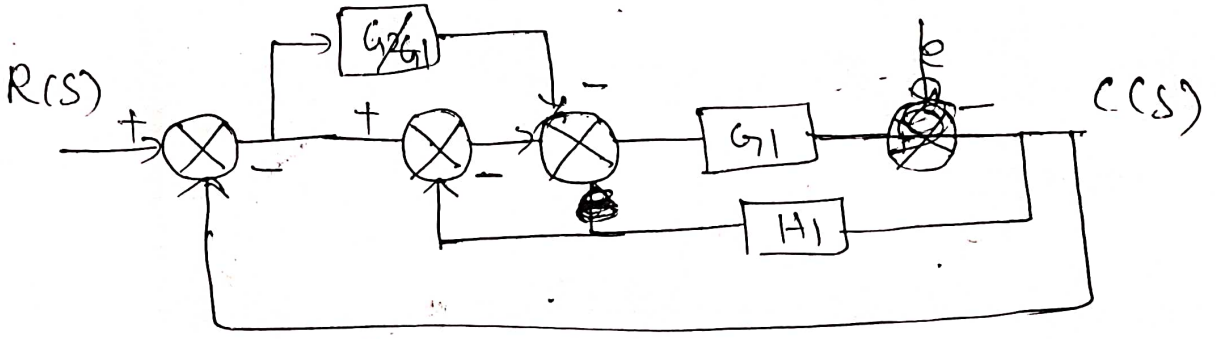


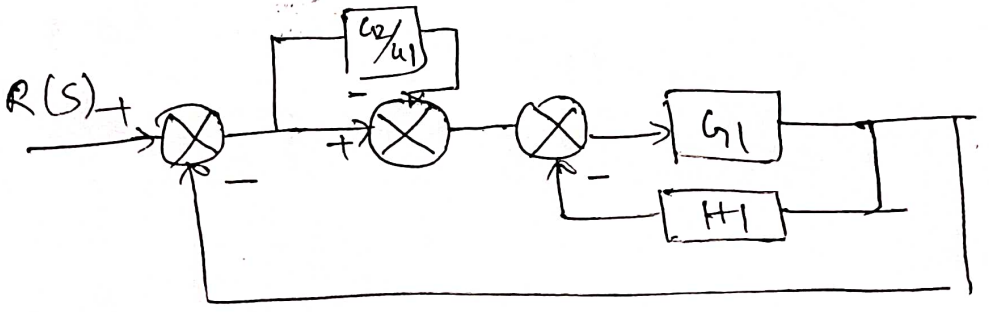
Shift summing point before block G1.

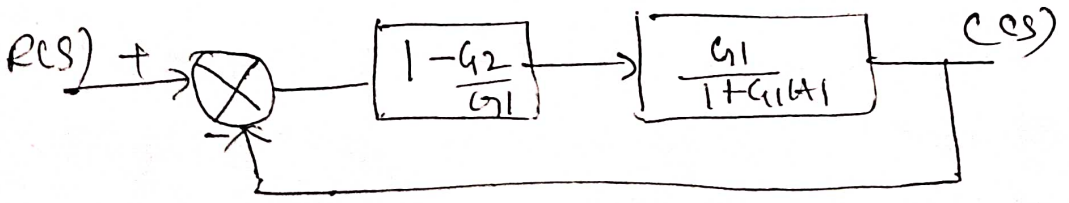


$= \frac{(X - G_2/G_1)\,G_1}{XG_1 - G_2}$









$$G(s) = \left[\frac{G_1 - G_2}{G_1}\right] \times \frac{G_1}{1 - G_1H_1}$$

$$= \frac{G_1 - G_2}{1 - G_1H_1}$$

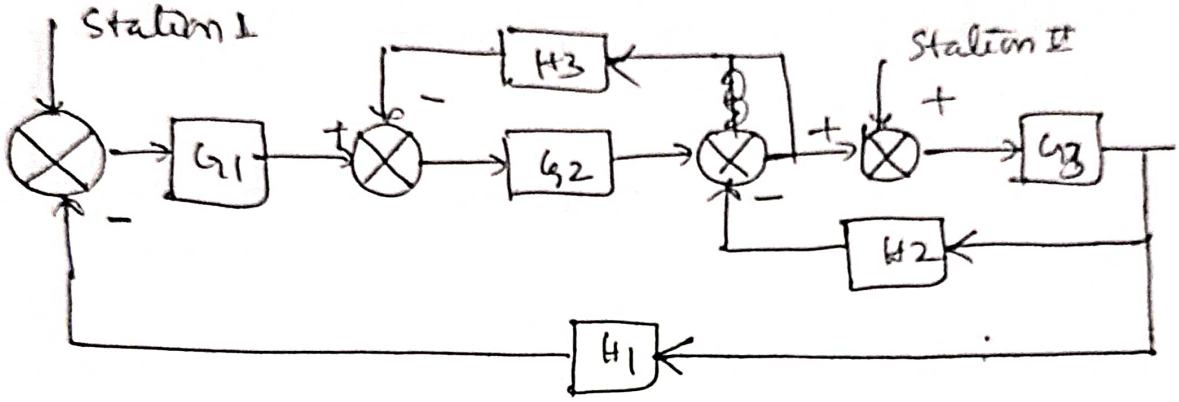
$$H(s) = 1$$

$$D.L.TF = \frac{\frac{G_1 - G_2}{1 + G_1H_1}}{1 + \frac{G_1 - G_2}{1 + G_1H_1} \times 1}$$

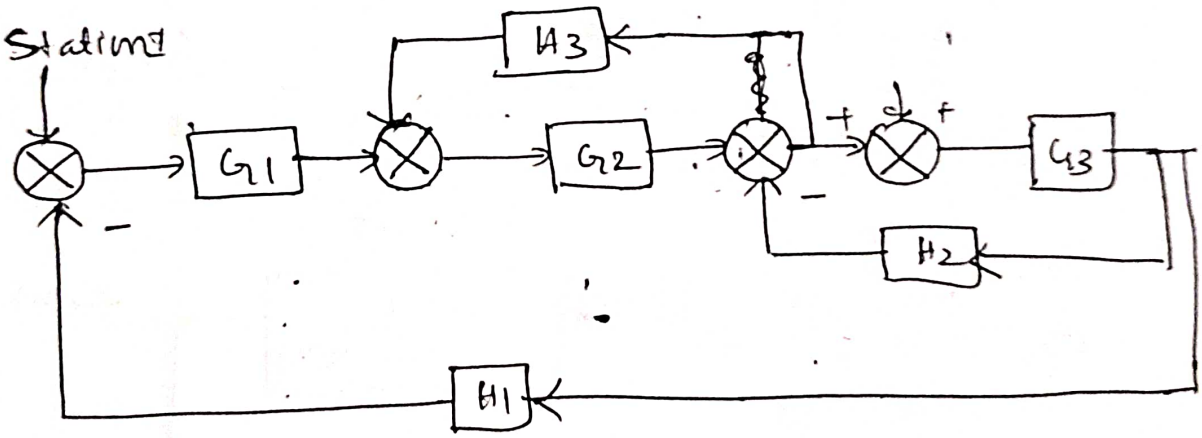
$$= \frac{G_1 - G_2}{1 + G_1H_1 + G_1 - G_2}$$

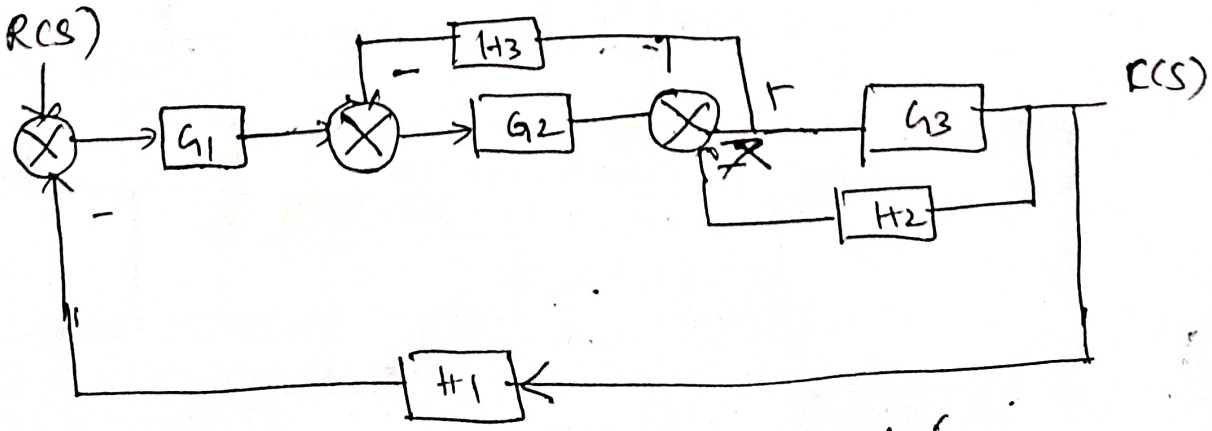
for the system represented by the block diagram shown in fig. determine the closed loop transfer function when the input is at a) station (1)

(b) Station II.



Consider station 1 as input & set station II = 0

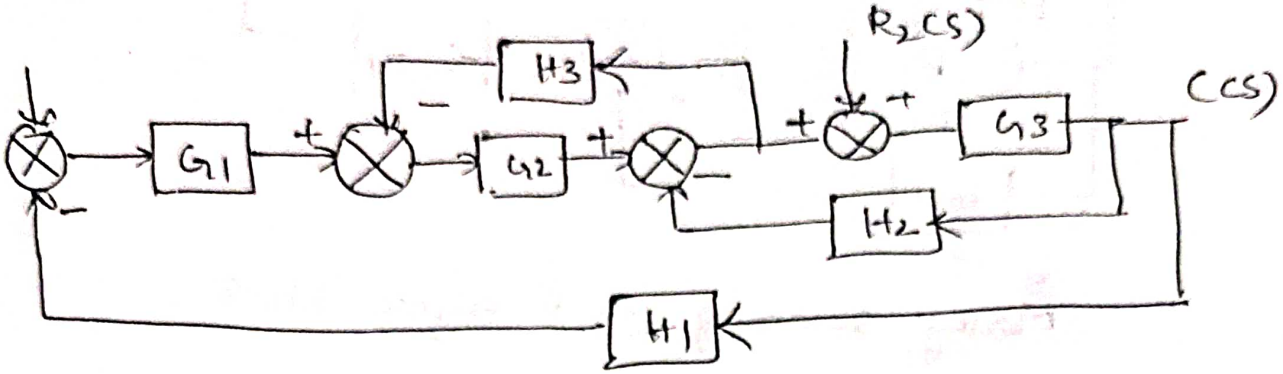


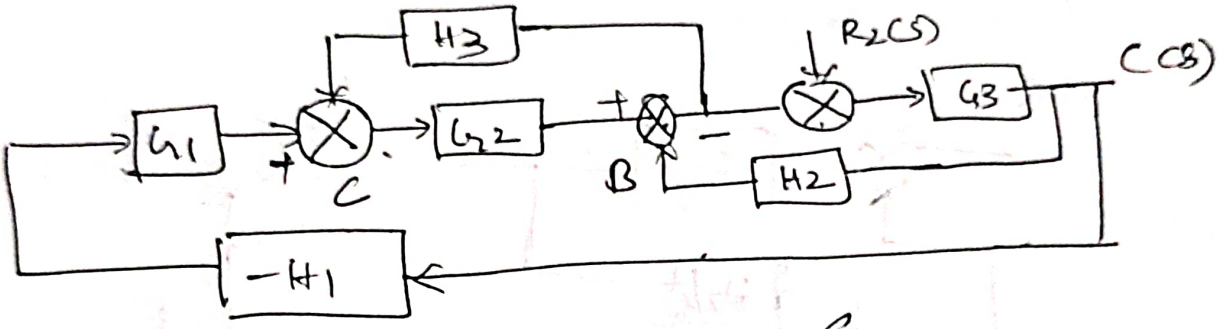


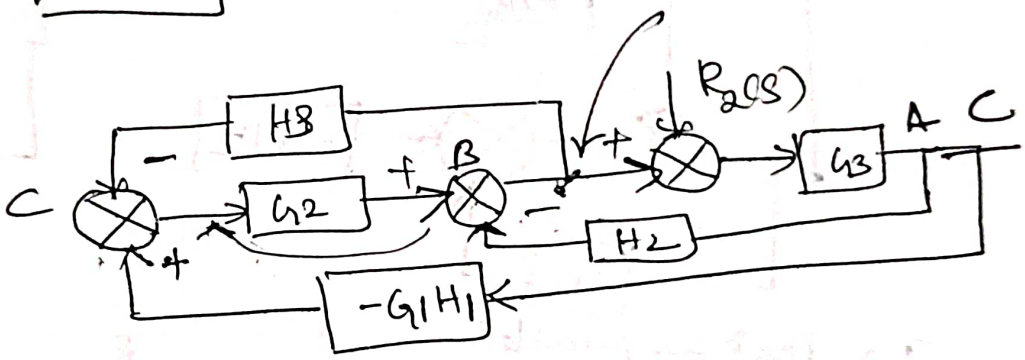
Shift takeoff point x after a block G3

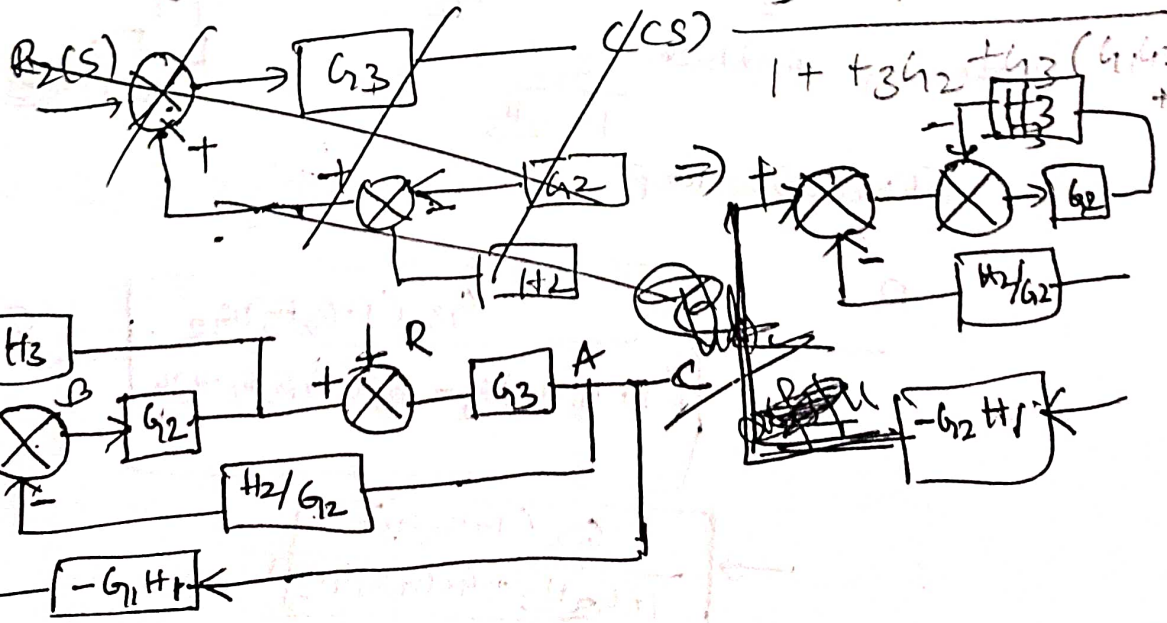
II case

Set Station I input $R_1(s) = 0$, consider Station 2 input $R_2(s)$

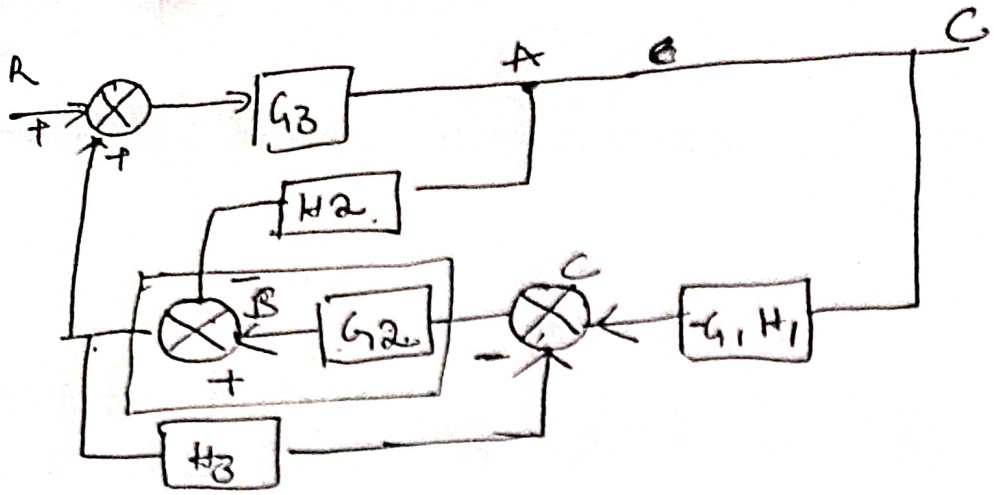




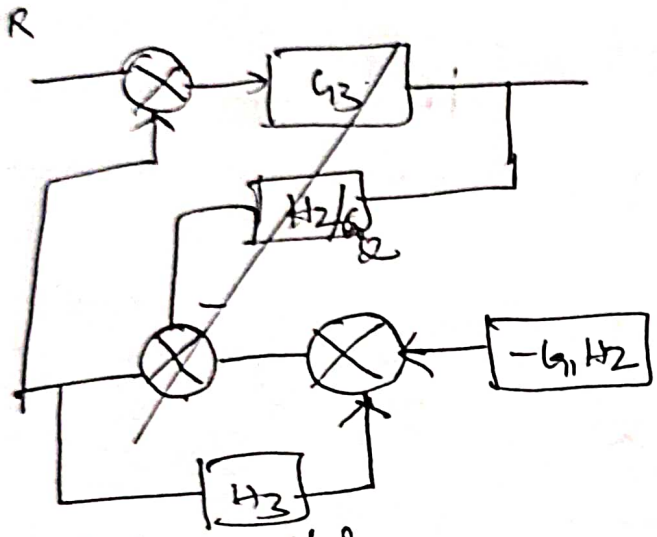


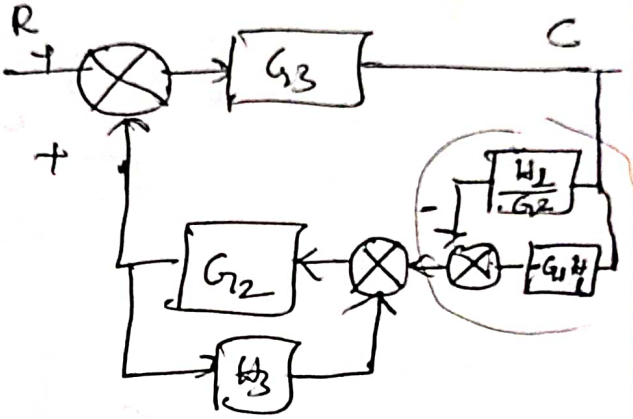


$$\frac{G_3(1+G_2H_3)}{1+G_3G_2+G_2(G_1G_2H_1+H_2)}$$



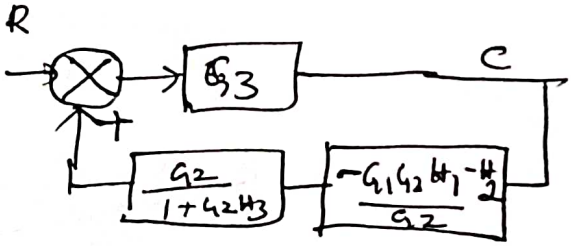
Moving summing point before block 2





Two block in parallel

$$-G_1H_f - \frac{H_2}{G_2} = \frac{-G_1G_2H_1 - H_2}{G_2}$$



Eliminating feedback $\frac{G_2}{1+G_2H_3}$

Eliminating loop.

$$R \rightarrow \boxed{\frac{G_3(1+G_2H_3)G_2}{(1+G_2H_3)G_2 - G_2(-G_1G_2H_1 - H_2)G_3}} \rightarrow C$$

$$\rightarrow \boxed{\frac{G_3(1+G_2H_3)}{1+G_2H_3 + G_3(G_1G_2H_1 + H_2)}}$$