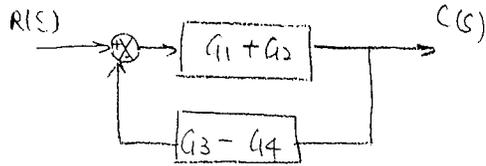


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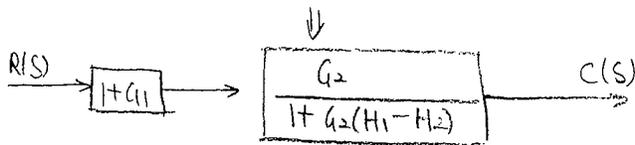
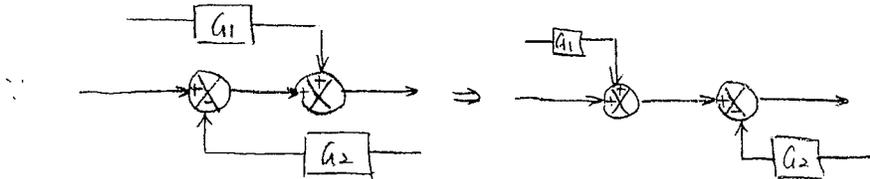
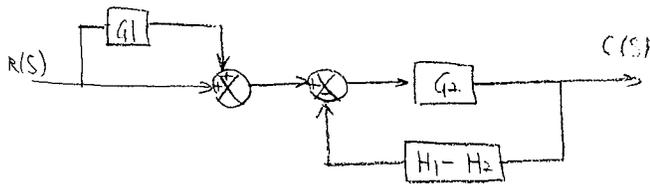
HW3 Solution

B-3-1



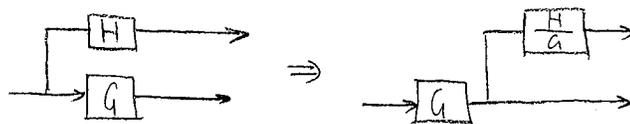
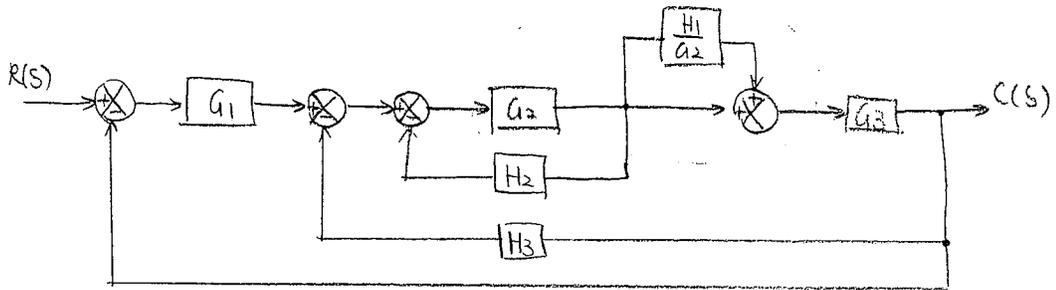
$$\frac{C(s)}{R(s)} = \frac{G_1 + G_2}{1 + (G_1 + G_2)(G_3 - G_4)}$$

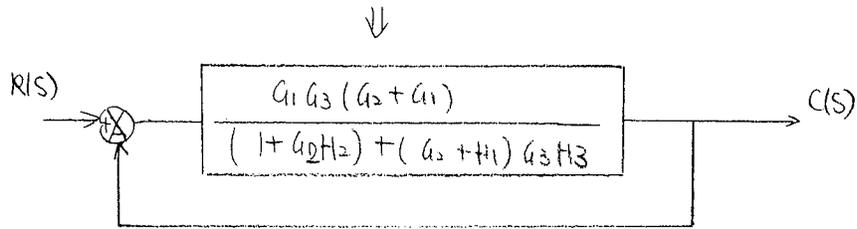
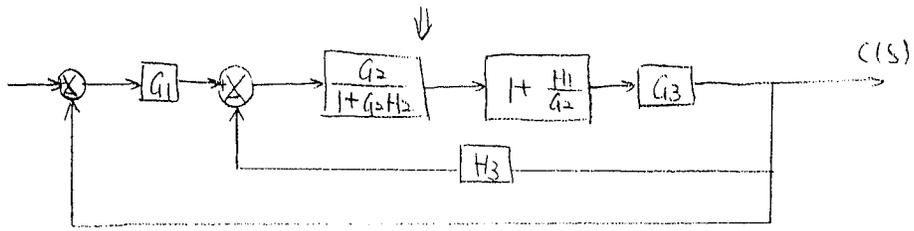
B-3-2



$$\frac{C(s)}{R(s)} = \frac{(1 + G_1)G_2}{1 + G_2(H_1 - H_2)}$$

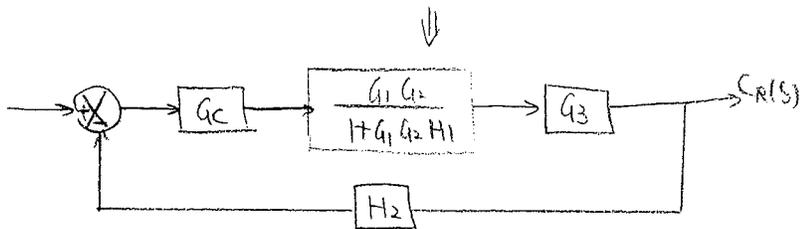
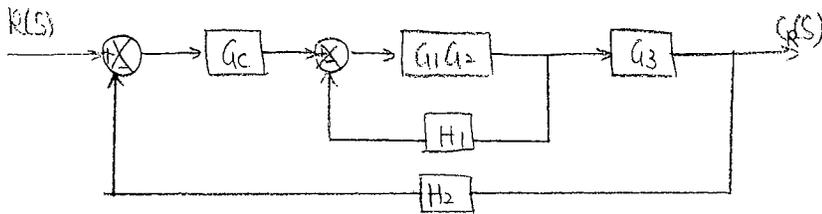
B-3-3





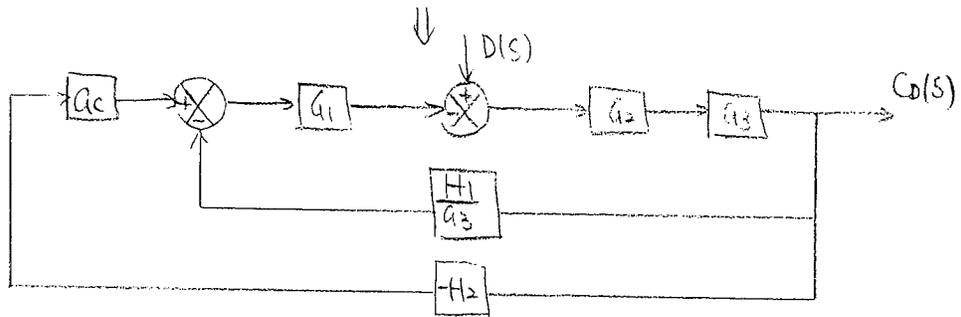
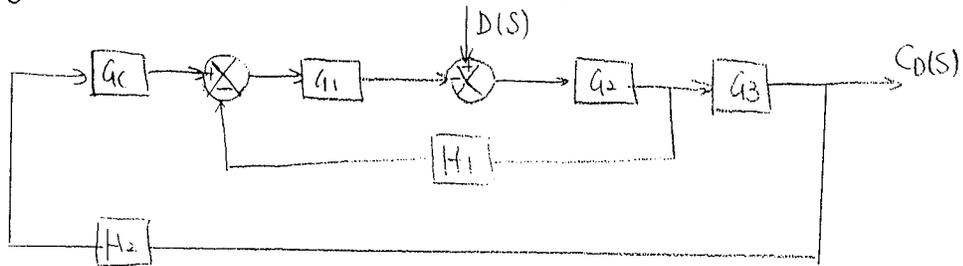
$$\frac{C(S)}{R(S)} = \frac{G_1 G_3 + G_1 G_3 H_1}{1 + G_2 H_2 + G_2 G_3 H_3 + G_3 H_1 H_3 + G_1 G_2 G_3 + G_1 G_3 H_1}$$

B-3-7 First, set $D(S) = 0$

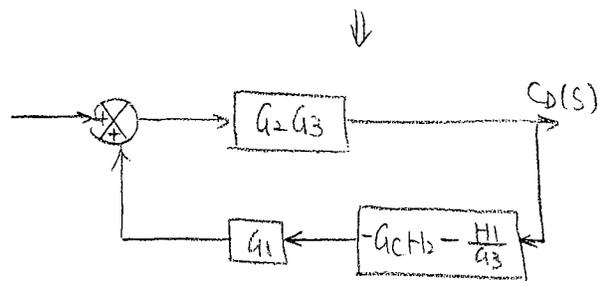
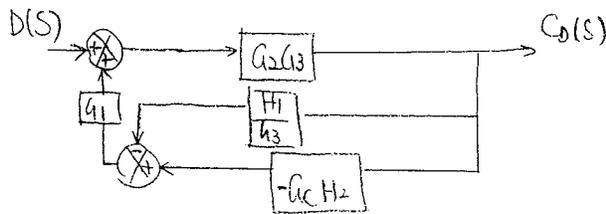


$$\frac{C(S)}{R(S)} = \frac{G_c G_1 G_2 G_3}{1 + G_1 G_2 H_1} = \frac{G_c G_1 G_2 G_3}{1 + \frac{G_c G_1 G_2 G_3 H_2}{1 + G_1 G_2 H_1}}$$

To get $\frac{C_D(s)}{D(s)}$, we set $R(s)$ to zero



Rearrange the block diagram,



$$\frac{C_D(s)}{D(s)} = \frac{G_2 G_3}{1 + G_2 G_3 G_1 (G_c H_2 + \frac{H_1}{a_3})} = \frac{G_2 G_3}{1 + G_1 G_2 G_3 G_c H_2 + G_1 G_2 H_1}$$