Universidade Federal de Uberlândia

Faculdade de Engenharia Elétrica

Sistemas de Controle

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Roteiro 08

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Uberlândia

69. $F(s) = (f_v s + 2)\, X(s)$

$$\frac{X(s)}{F(s)} = \frac{1/f_v}{s + 2/f_v} \qquad T_s = \frac{4}{\sigma} = \frac{4}{2/f_v} = 2f_v \qquad f_v = \frac{T_s}{2}$$

70.
$$F(s) = \frac{\frac{1}{M}}{s^2 + \frac{1}{M}s + \frac{K}{M}} \qquad T_s = 4 = \frac{4}{|Re|} = 8M \qquad M = \frac{1}{2}$$

$$|Re| = \frac{1}{2M}$$

$$s_{1,2} = -1 \pm j\sqrt{2K-1}$$

$$T_p = 1 = \frac{\pi}{|Im|} = \frac{\pi}{\sqrt{2K-1}} \qquad K = 5,43$$

73. $T(s) = \left[s^3 + D(s)^2 s + \frac{1}{4}(10)^2\right]\Theta(s)$

$$\frac{\Theta(s)}{T(s)} = \frac{1}{s^2 + 25Ds + 25}$$

$$\zeta = \frac{-\ln\left(\frac{1,05}{100}\right)}{\sqrt{\pi^2 + \ln^2\left(\frac{1,05}{100}\right)}} = 0,358$$

$$2\zeta = 2 \cdot 0,358 \cdot 5 = 25D$$

$$D = 0,14$$

data
fecha

P6. $\frac{V_6(s)}{V(s)} = \frac{\frac{1}{Cs}}{R+Ls+\frac{1}{Cs}} = \frac{10^6}{s^2+Rs+10^6}$

$\xi = 0,456 \qquad 2\xi\omega_n = R = 2 \cdot 0,456 \cdot 10^3 = 912\,\Omega$

P5. $T_{eq}(s) = (J_{eqL}s^2 + D_{eqL}s + K)\theta_L(s) + F(s)\,7$

$n = 2$

$J_{eqL} = 1 \cdot 2^2 + 1 = 5 \qquad D_{eqL} = 1 \cdot 2^2 = 4$

$T_{eq}(s) = (5s^2 + 4s + K)\theta_L(s) + 2F(s)$

$F(s) = (Ms^2 + s)X(s)$

$T_{eq}(s) = (5s^2 + 4s + K)\theta_L(s) + (Ms^2 + s)2X(s)$

$\theta_L(s) = \frac{X(s)}{7} = \frac{X(s)}{2} \qquad T_{eq}(s) = 2T(s)$

$T(s) = \left[(5+4M)s^2 + 8s + K\right]\frac{X(s)}{4} = T(s)$

$$\frac{X(s)}{T(s)} = \frac{\frac{4}{5+4M}}{s^2 + \frac{8}{5+4M}s + \frac{K}{5+4M}}$$

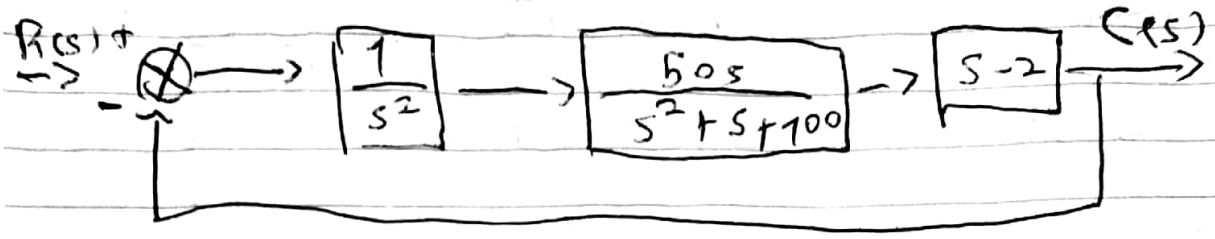
$T_s = 1S = \frac{4}{Re} = \frac{4}{\frac{8}{2(5+4M)}} = 5 + 4M \qquad M = \frac{5}{2}$

$\xi = 0,5912 \qquad 2\xi\omega_n = \frac{8}{5+4M} = 0,5333 \qquad \omega_n = 0,45$

$\omega_n = \sqrt{\frac{K}{5+4M}} = 0,4510 \qquad K = 3,051$

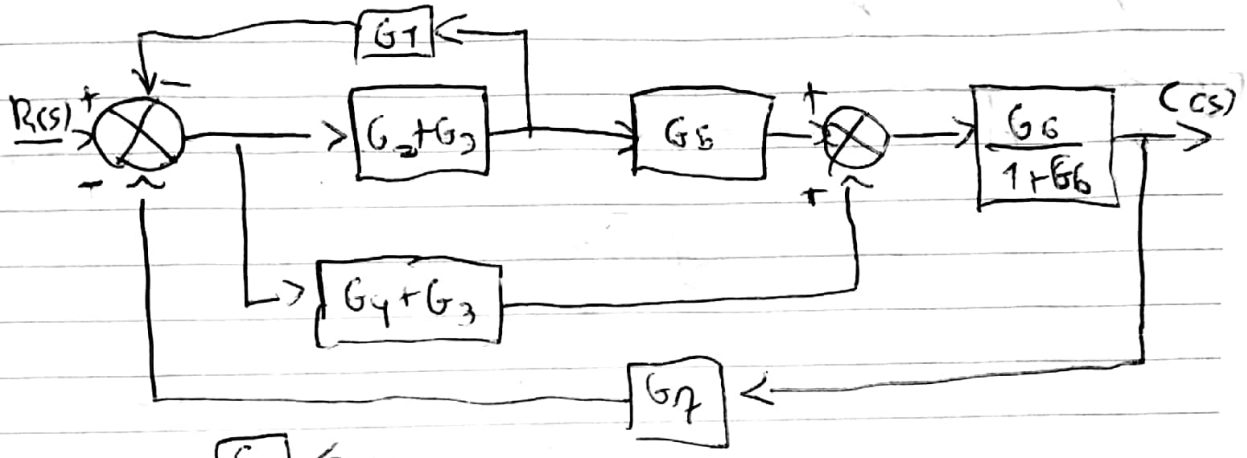
Nise Cap. 5

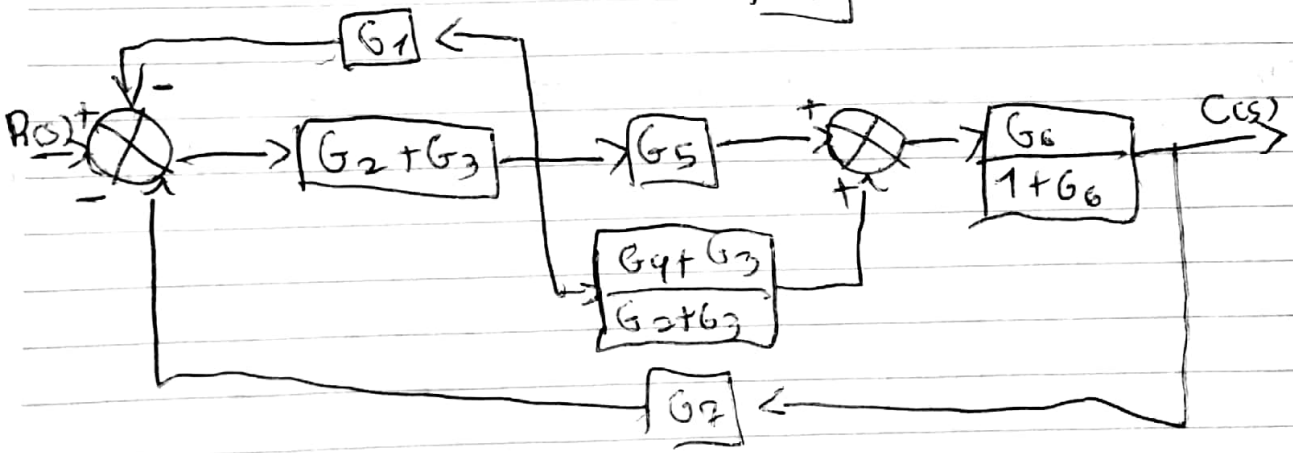
1.

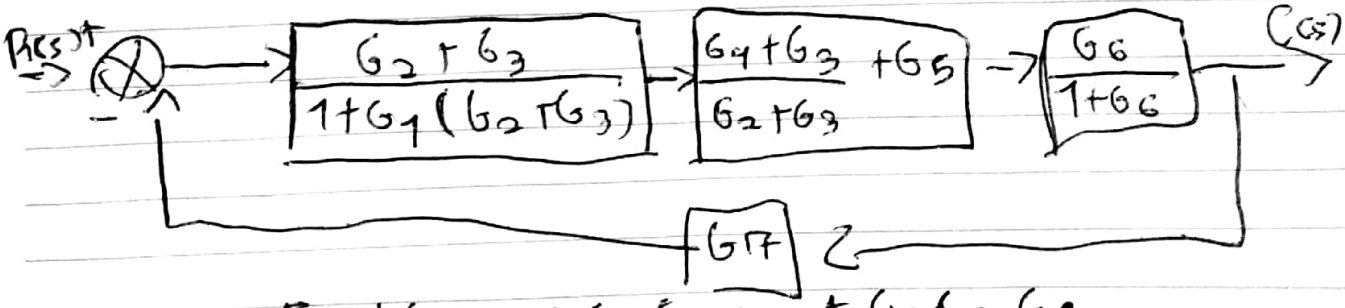


$$T(s) = \frac{50(s-2)}{s^3+s^2+150s-100}$$

3.

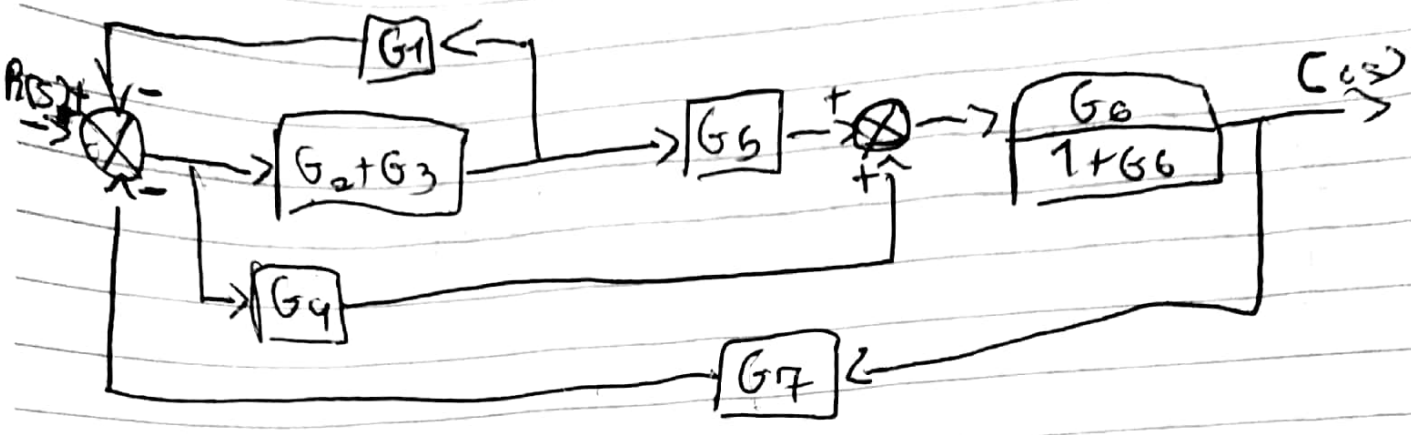


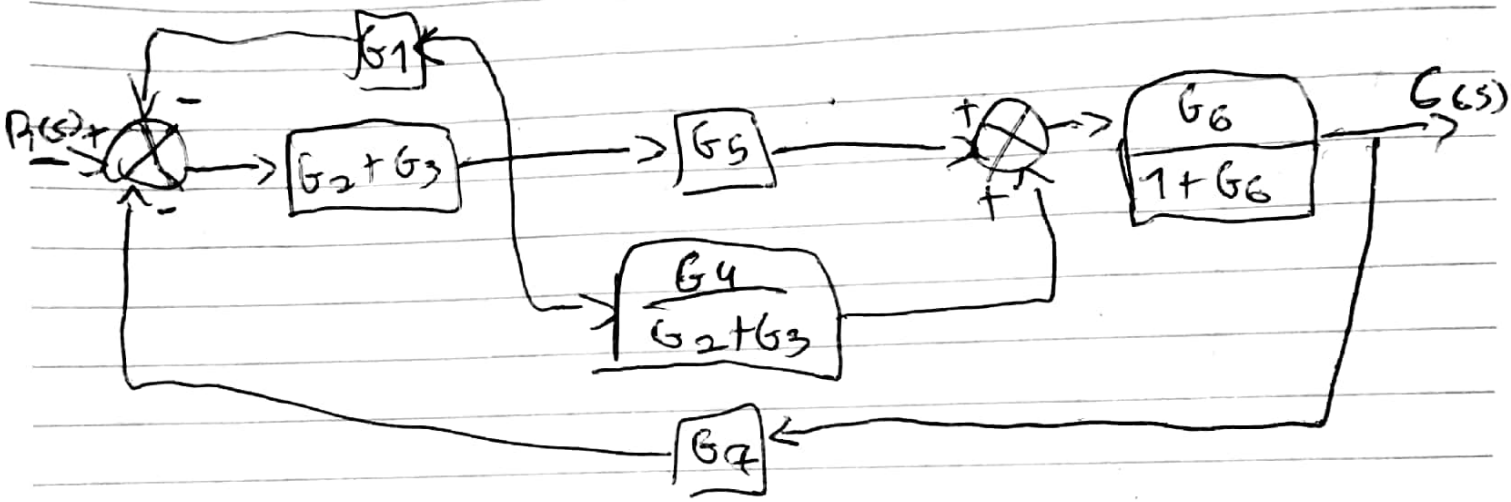




$$T(s) = \frac{G_6G_4 + G_6G_3 + G_6G_5G_3 + G_6G_5G_2}{1+G_6+G_3G_1+G_2G_1+G_7G_6G_4+G_7G_6G_3+G_7G_6G_5G_3+G_7G_6G_5G_2 \rightarrow +G_6G_3G_1+G_6G_2G_1}$$

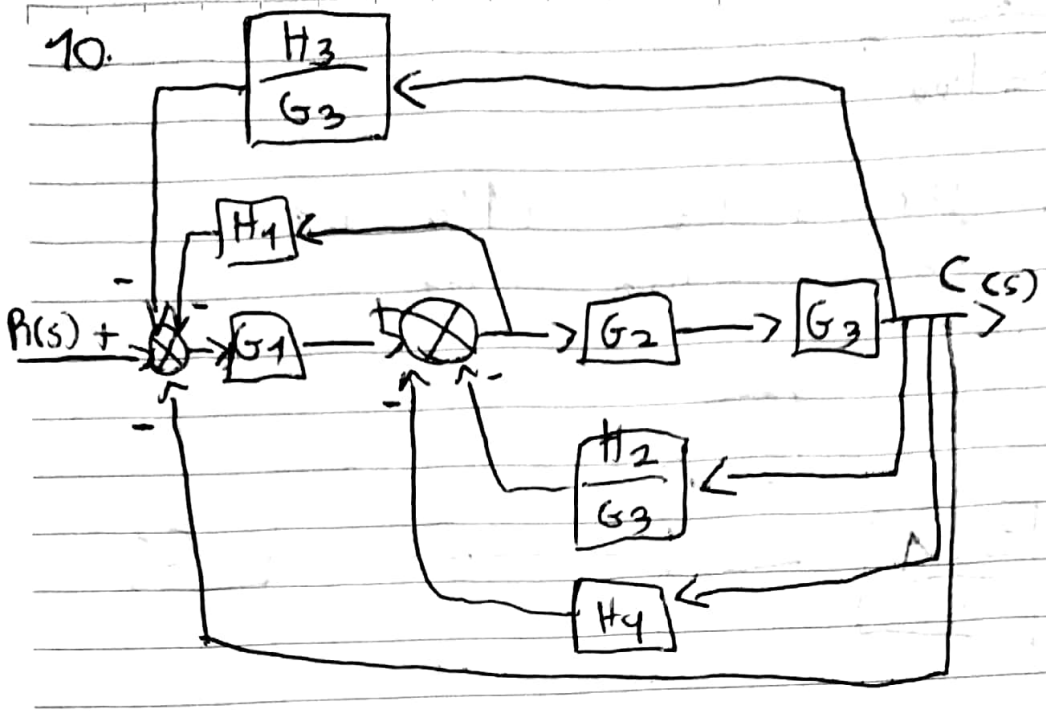
9.

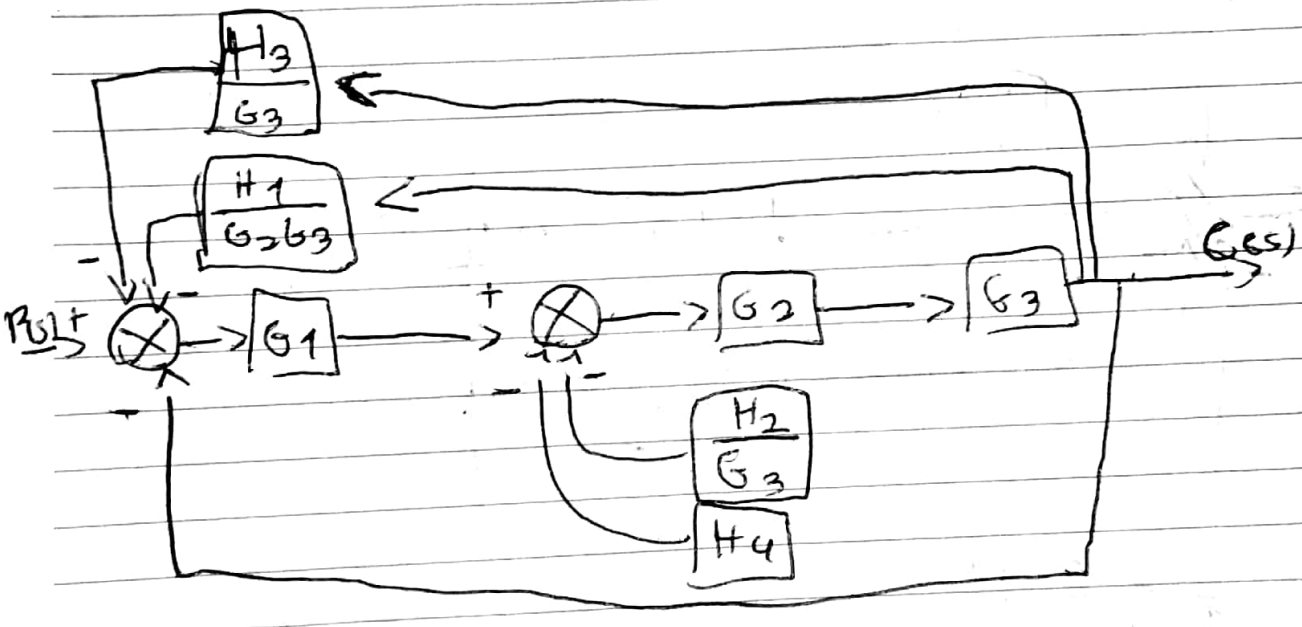


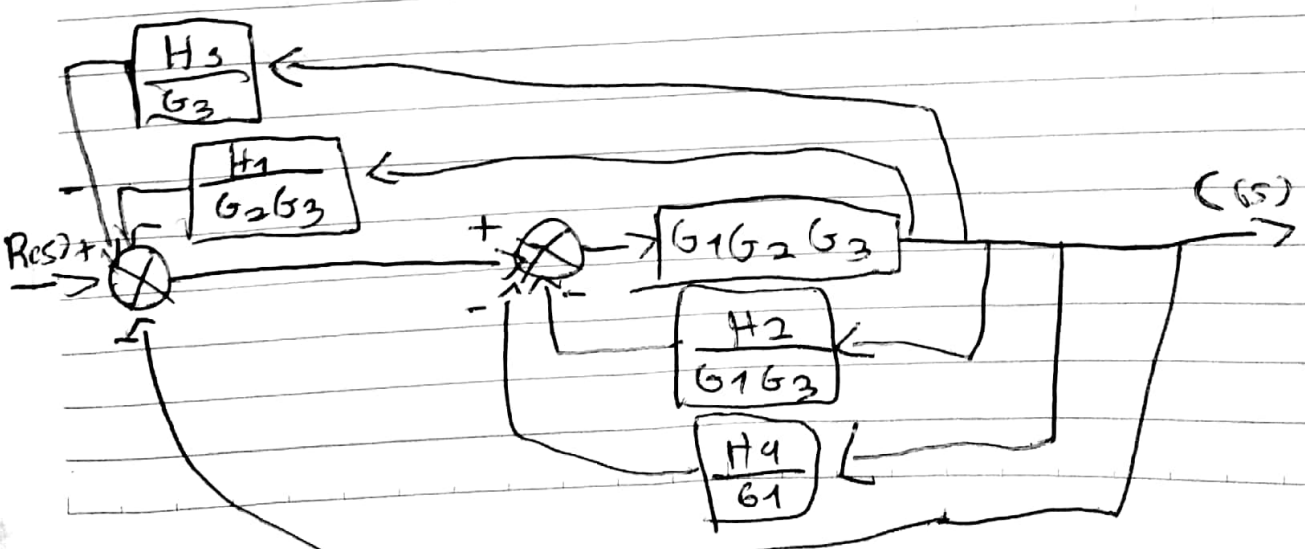


$$T(s) = \frac{G_6(G_4 + G_5G_3 + G_5G_2}{G_6(G_7G_4 + G_7G_5G_3 + G_7G_5G_2 + G_3G_1 + G_2(G_1+1)) + G_1(G_3+G_2)+1}$$

10.







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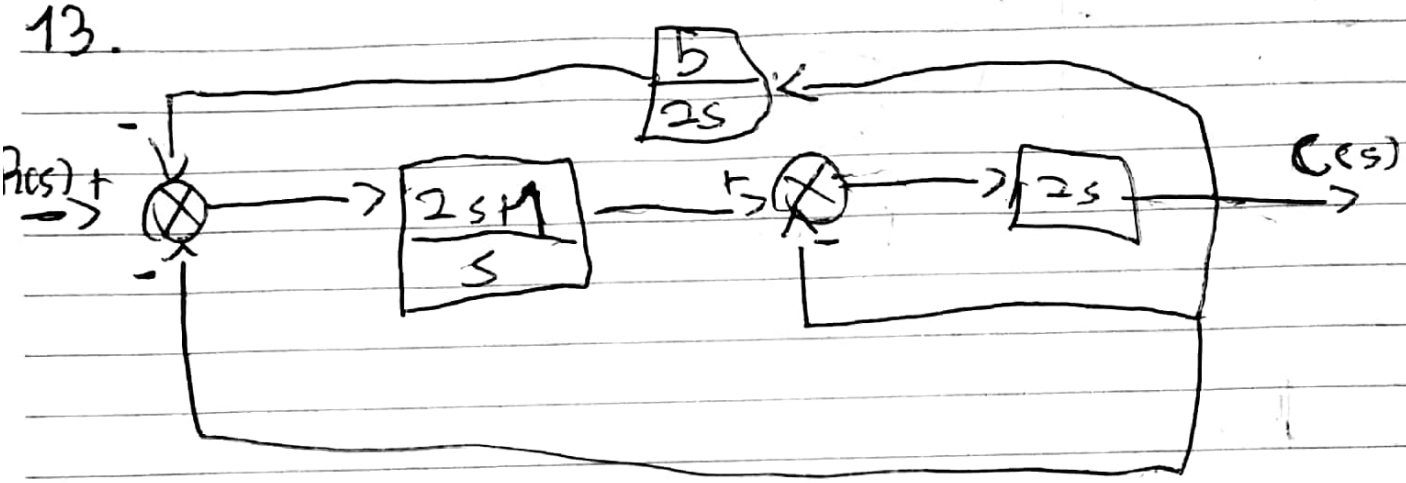
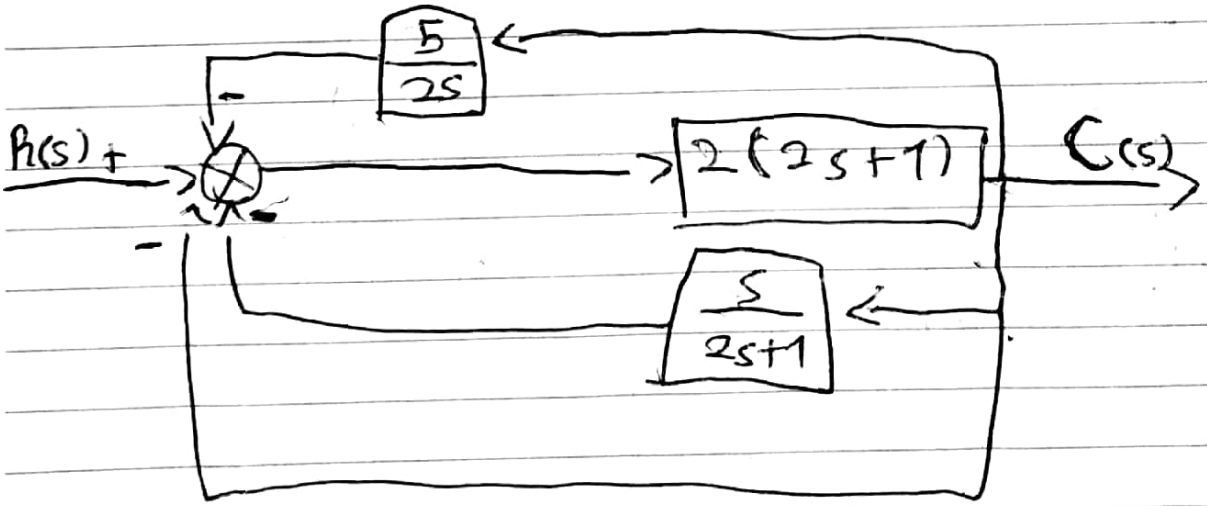
$$T(s) = \frac{G_1 G_2 G_3}{1 + G_1 G_2 G_3 H_{eq}}$$

$$H_{eq} = \frac{H_3}{G_3} + \frac{H_1}{G_2 G_3} + \frac{H_2}{G_1 G_3} + \frac{H_4}{G_1} + 1$$

13.





$$T(s) = \frac{2(2s+1)}{1 + 2(2s+1) H_{eq}}$$

$$H_{eq} = 1 + \frac{5}{2s+1} + \frac{5}{2s}$$