

# Modelagem

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1)

$$\begin{cases} Y = (I + GH)^{-1} GR \\ Y = TR \end{cases} \rightarrow T = (I + GH)^{-1} G$$

Blacas :  $Z = HY \rightarrow R - E = HY \rightarrow R - G^{-1}Y = HY \rightarrow R = (G^{-1} + H)Y$   
 $R = (I + HG)G^{-1}Y \rightarrow (I + HG)^{-1}R = G^{-1}Y \rightarrow Y = G(I + HG)^{-1}R$   
 $\therefore T = G(I + HG)^{-1}$

Dessa forma :  $G(I + HG)^{-1} = (I + GH)^{-1}G = G(I + L)^{-1}$

Sonda  $L = HG$

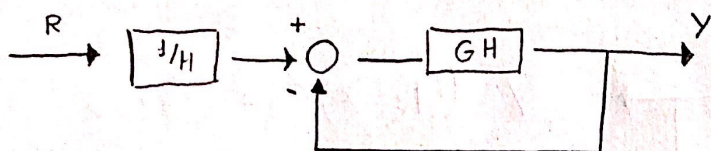
2)

$Z = HY \rightarrow Z = HGE = HG(R - Z) \rightarrow HGR = (I + HG)Z \rightarrow (I + HG)^{-1}HG = ZR^{-1}$   
 $Y = GE \rightarrow H^{-1}Z = G(R - Z) \rightarrow GR = (H^{-1} + G)Z = (I + GH)H^{-1}Z$   
 $\therefore ZR^{-1} = H(I + GH)^{-1}G$

Combinando :  $\frac{Z}{R} = \frac{L}{I + L} = \frac{GH}{I + GH} = \frac{HG}{I + HG}$   
 $C/L = HG$

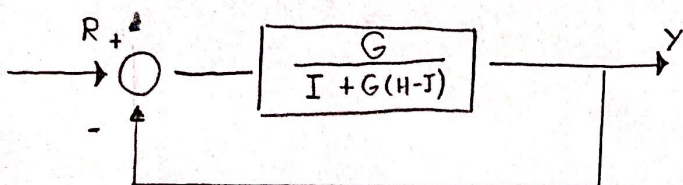
$Z = HY = HG(R - Z) \rightarrow \frac{Z}{R} = \frac{HG}{I + HG}$

3)



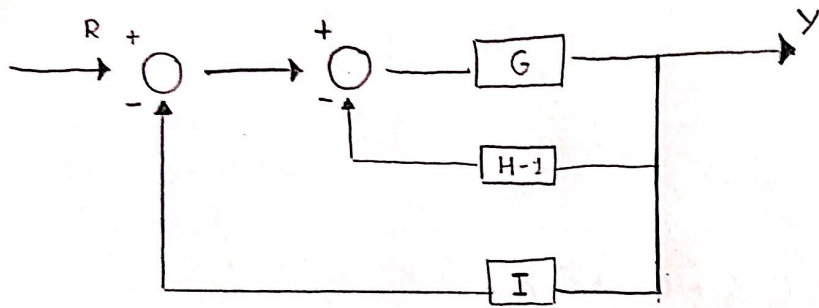
$Y = \left(\frac{R}{H} - Y\right)GH \rightarrow Y = \frac{GR}{I + GH}$

4)



$Y = (R - Y) \frac{G}{I + G(H - I)} \rightarrow Y = \frac{GR}{I + GH}$

5)

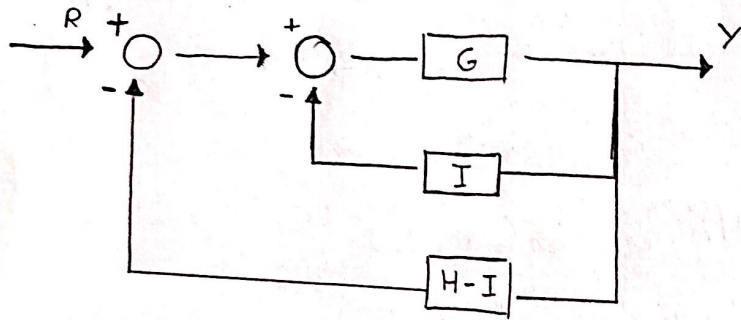


$$Y = (R - I - Y(H-1))G$$

↓

$$Y = \frac{GR}{1+HG}$$

6)

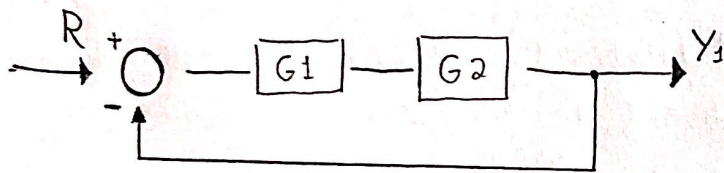


$$Y = (R - Y(H-I) - YI)G$$

↓

$$Y = \frac{GR}{I+GH}$$

7)

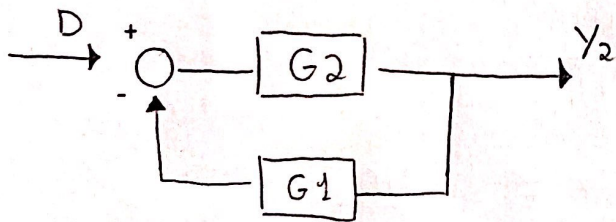


$$Y_1 = (R - Y_1)G_1G_2$$

↓

$$Y_1 = \frac{RG_1G_2}{1+G_1G_2}$$

8)

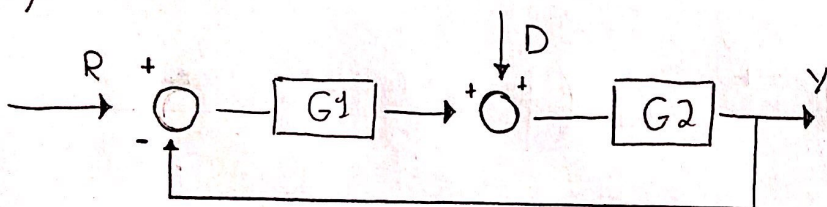


$$Y_2 = (D - Y_2G_1)G_2$$

↓

$$Y_2 = \frac{DG_2}{1+G_1G_2}$$

9)



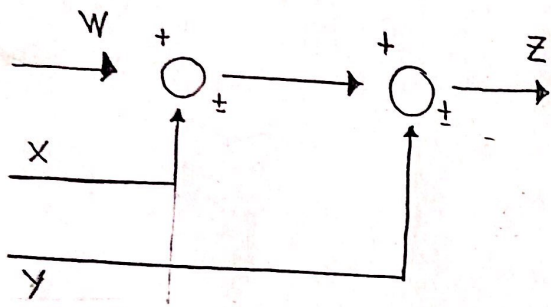
$$Y = ((R - Y)G_1 + D)G_2$$

↓

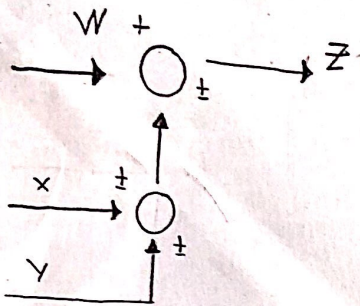
$$Y = \frac{(RG_1 + D)R}{1 + G_1G_2}$$



10)



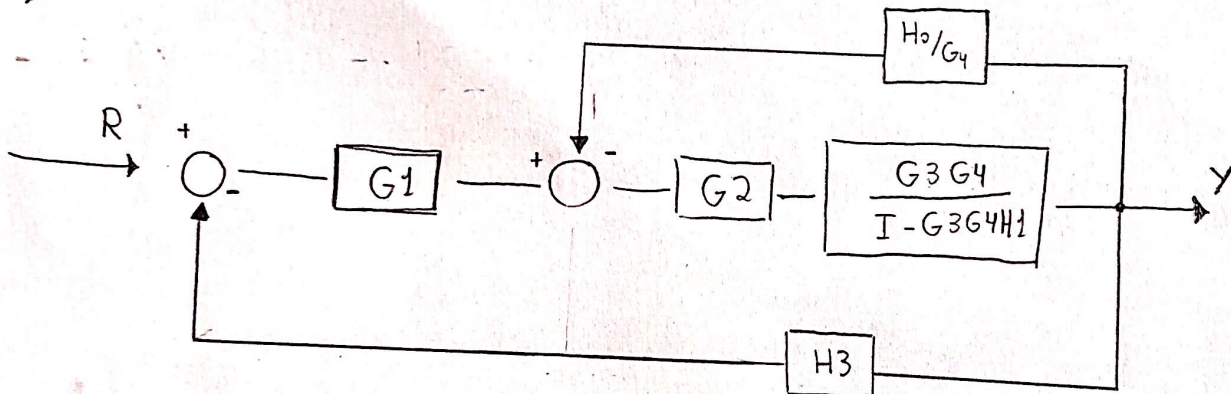
$$Z = W + X + Y$$



$$Z = W + X + Y$$

• Os dois esquemas de blocos coincidem

11)

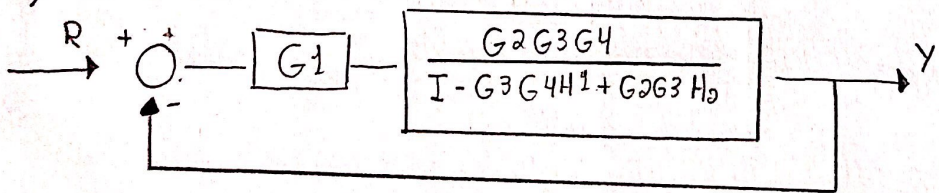


$$Y = \left[ (R - H_3 Y) G_1 - Y \frac{H_2}{G_4} \right] G_2 \cdot \frac{G_3 G_4}{I - G_3 G_4 H_1}$$

$$\downarrow$$

$$Y = \frac{R G_1 G_2 G_3 G_4}{I - H_1 G_3 G_4 + H_2 G_2 G_3 + H_3 G_1 G_2 G_3 G_4}$$

12)



$$Y = (R - Y) G_1 \cdot \frac{G_2 G_3 G_4}{I - G_3 G_4 H_1 + G_2 G_3 H_2} \rightarrow Y = \frac{R G_1 G_2 G_3 G_4}{I - H_1 G_3 G_4 + H_2 G_2 G_3 + H_3 G_1 G_2 G_3 G_4}$$