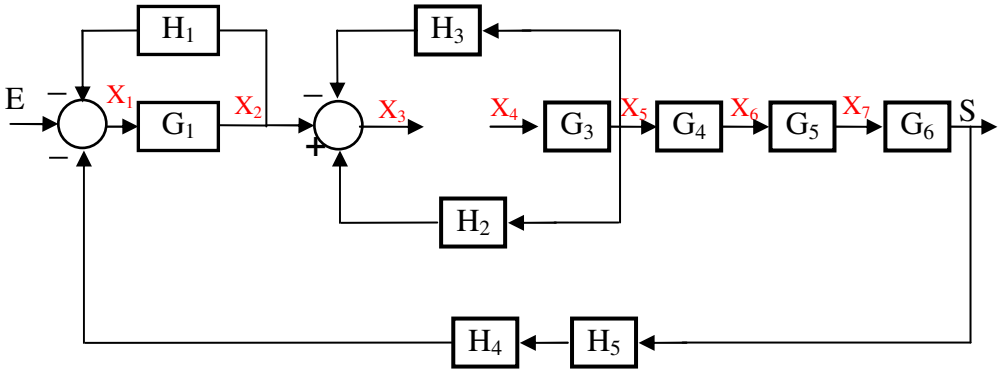
P6) Se quiere implantar un sistema de control ……

$X_1 = E - H_4 * H_5.*S - H_1*X_2$; $X_2 = G_1 * X_1$
$X_3 = X_2 + H_2 * X_5 - H_3 * X_5$; $X_5 = G_3 * X_4$; $X_6 = G_4 * X_5$
$X_7 = G_5 * X_6$; $S = G_6 * X_7$

a) Dibuja el diagrama de bloques.



b) Simplifica.

$X_1 = E - H_4 * H_5.*S - H_1*X_2$; $X_2 = G_1 * X_1$

$X_3 = X_2 + H_2 * X_5 - H_3 * X_5$; $X_5 = G_3 * X_4$; $X_6 = G_4 * X_5$

$X_7 = G_5 * X_6$; $S = G_6 * X_7$

$X_7 = G_5 * X_6$; $S = G_6 * X_7 = G_6 * G_5 * X_6 = G_6 * G_5 * G_4 * X_5 = G_6 * G_5 * G_4 * G_3 * X_4$

$S = G_6 * G_5 * G_4 * G_3 * X_4$

$X_1 = E - H_4 * H_5.*S - H_1*X_2$; $X_1 = E - H_4 * H_5.*S - H_1*(G_1 * X_1)$; $X_1 + H_1*G_1 * X_1 = E - H_4 * H_5.*S$

$X_1*(1+H_1*G_1) = E - H_4 * H_5.*S$

$$X_1 = \frac{E - H_4 * H_5.*S}{1 + H_1 * G_1} \quad ; \quad X_2 = G_1 * \frac{E - H_4 * H_5.*S}{1 + H_1 * G_1} \quad ; \quad X_3 = G_1 * \frac{E - H_4 * H_5.*S}{1 + H_1 * G_1} + (H_2 - H_3) * X_5$$

$$S = G_6 * G_5 * G_4 * X_5 \quad ; \quad X_5 = \frac{S}{G_6 * G_5 * G_4} \quad ; \quad X_3 = G_1 * \frac{E - H_4 * H_5.*S}{1 + H_1 * G_1} + (H_2 - H_3) * \frac{S}{G_6 * G_5 * G_4}$$

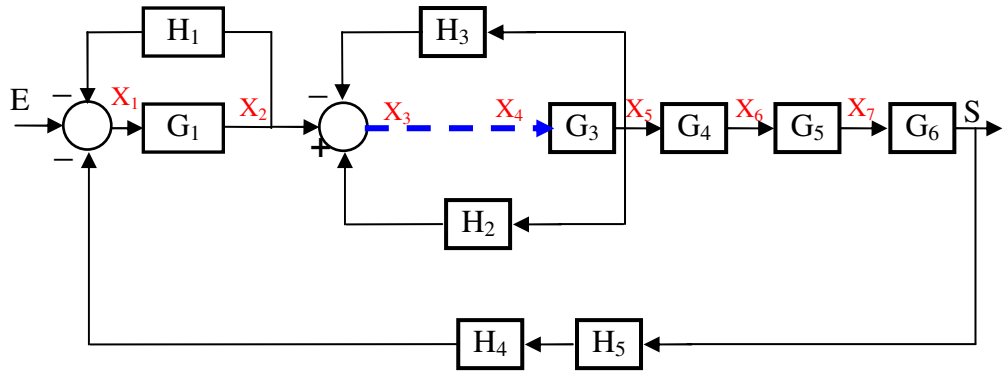
$$X_3 = \frac{G_1 * E - G_1 * H_4 * H_5.*S}{1 + H_1 * G_1} + (H_2 - H_3) * \frac{S}{G_6 * G_5 * G_4}$$

$$X_3 = \frac{G_1 * E}{1 + H_1 * G_1} - \frac{G_1 * H_4 * H_5}{1 + H_1 * G} * S + \frac{\mathbf{(H_2 - H_3) * S}}{\mathbf{G_6 * G_5 * G_4}} \qquad X_3 = \frac{G_1 * E}{1 + H_1 * G_1} - \left(\frac{G_1 * H_4 * H_5}{1 + H_1 * G} - \frac{(H_2 - H_3)}{G_6 * G_5 * G_4} \right) * S$$

$$\mathbf{X_3 = \frac{G_1}{1 + H_1 * G_1} * E - \left(\frac{G_6 * G_5 * G_4 * G_1 * H_4 * H_5 - H_2 + H_3 - H_2 * H_1 * G_1 + H_1 * H_3 * G_1}{G_6 * G_5 * G_4 + G_6 * G_5 * G_4 * G_1 * H_1} \right) * S}$$

Es evidente que aquí se acaba el problema “tal cual” nos lo plantean.

Si estuviera planteado de otra forma, por ejemplo: $X_3=X_4$. Entonces:



X_1= E - H_4* H_5.*S – H_1*X_2 ; X_2= G_1* X_1

X_3= X_2 + H_2* X_5 – H_3* X_5 ; X_3 = X_4 ; X_5= G_3* X_4 ; X_6= G_4* X_5

X_7= G_5* X_6 ; S = G_6* X_7

X_7= G_5* X_6 ; S = G_6* X_7 = G_6* G_5* X_6 = G_6* G_5* G_4* X_5 = G_6* G_5* G_4* G_3 * X_4 ; X_4 = X_4

S = G_6* G_5* G_4* G_3* X_3

X_1= E - H_4* H_5.*S – H_1*X_2 ; X_1= E - H_4* H_5.*S – H_1* G_1* X_1 ; X_1 + H_1* G_1* X_1 = E - H_4* H_5.*S

X_1 (1+ H_1* G_1) = E - H_4* H_5.*S ; $X_1 = \frac{E - H_4 * H_5 * S}{1 + H_1 * G_1}$; $X_2 = \frac{G_1 * E - G_1 * H_4 * H_5 * S}{1 + H_1 * G_1}$

$$X_3 = \frac{G_1 * E - G_1 * H_4 * H_5 * S}{1 + H_1 * G_1} + (H_2 - H_3) * X_5 \quad ; \quad X_4 = \frac{G_1 * E - G_1 * H_4 * H_5 * S}{1 + H_1 * G_1} + (H_2 - H_3) * X_5$$

$$X_5 = \frac{G_3 * G_1 * E - G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1} + G_3 * (H_2 - H_3) * X_5$$

$$X_5 - G_3 * (H_2 - H_3) * X_5 = \frac{G_3 * G_1 * E - G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1}$$

$$X_5 * [1 - G_3 (H_2 - H_3)] = \frac{G_3 * G_1 * E - G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1} \quad ; \quad X_5 = \frac{G_3 * G_1 * E - G_3 * G_1 * H_4 * H_5 * S}{(1 + H_1 * G_1) * [1 - G_3 * (H_2 - H_3)]}$$

$$X_5 = \frac{G_3 * G_1 * E - G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} \quad ;$$

$$X_6 = \frac{G_4 * G_3 * G_1 * E - G_4 * G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} \quad ;$$

$$X_7 = \frac{G_5 * G_4 * G_3 * G_1 * E - G_5 * G_4 * G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)}$$

$$S = \frac{G_6 * G_5 * G_4 * G_3 * G_1 * E - G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5 * S}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)}$$

$$S = \frac{G_6 * G_5 * G_4 * G_3 * G_1}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * E - \frac{G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * S$$

$$S + \frac{G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * S = \frac{G_6 * G_5 * G_4 * G_3 * G_1}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * E$$

$$S * (1 + \frac{G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)}) = \frac{G_6 * G_5 * G_4 * G_3 * G_1}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * E$$

$$S = \frac{\frac{G_6 * G_5 * G_4 * G_3 * G_1}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)} * E}{1 + \frac{G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3)}}$$

$$S = \frac{G_6 * G_5 * G_4 * G_3 * G_1}{1 + H_1 * G_1 - G_3 * (H_2 - H_3) - H_1 * G_1 * G_3 * (H_2 - H_3) + G_6 * G_5 * G_4 * G_3 * G_1 * H_4 * H_5} * E$$

¡¡¡¡Feliz Navidad!!!!