Homework_1

پریا نصیرزاده

ex1

$$C(S) = G_1 + G_2 \times (R(S) - H_1 \times C(S) + D(S) - H_2 \times C(S))$$

$$\rightarrow C(S) = (G_1 \times G_2 \times R(S)) - (G_1 \times G_2 \times H_1 \times C(S)) + (G_1 \times G_2 \times D(S)) - (G_1 \times G_2 \times H_2 \times C(S))$$

$$\rightarrow C(S) + (G_1 \times G_2 \times H_1 \times C(S)) + (G_1 + G_2 \times H_2 \times C(S)) = (G_1 \times G_2 \times R(S)) + (G_1 \times G_2 \times D(S))$$

$$\xrightarrow[\text{گیری}]{\text{فاکتور}} C(S)(1 + G_1 \times G_2 \times H_1 + G_1 \times G_2 \times H_2) = G_1 \times G_2 \times R(S) + G_1 + G_2 \times D(S)$$

$$C(S) \times (1 + G_1 \times G_2 \times H_1 + G_1 \times G_2 \times H_2) = G_1 \times G_2 \times (-R(S))$$

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

$$C(S) + (1 + G_1 \times G_2 \times H_1 + G_1 \times G_2 \times H_2) = G_1 \times G_2 \times D(S)$$

$$\frac{C(S)}{D(S)} = \frac{G_1 * G_2}{(1 + G_1 * G_2 \times H_1 + G_1 \times G_2 \times H_2)}$$

$$\left.\begin{aligned} \dot{x} &= Ax + Bu \\ y &= Cx + Du \end{aligned}\right\} \xrightarrow{\text{متغیر تغییر حالت}} x = [u , w , q , \theta]^T$$ ۲)

$$A = \begin{bmatrix} (\bar{q}\frac{S}{m}) \times (-(C_{D_u} + 2C_{D_1}/u_1) + (C_{T_{x_u}} + C_{T_{x_1}}/u_1) & " & " & " \\ -(\bar{q}\frac{S}{m}) \times (C_{L_u} + 2L_1)/u_1 - (\bar{q}\frac{S}{m}) \times (C_{L_\alpha} + C_{D_1})/u_1 & " & " & " \\ (\bar{q}S \times \bar{c}/I_{yy}) \times (C_{m_u} + 2C_{m_1})/u_1 + (C_{m_{T_u}} + C_{m_{T_1}})/u_1 & " & " & " \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$B = \begin{bmatrix} -(\bar{q}\frac{S}{m}) \times C_{D_{\delta E}} \\ -(\bar{q}S/m) \times C_{L_{\delta E}} \\ (\bar{q}S \times \bar{c}/I_{yy}) \times C_{m_{\delta E}} \\ 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 , & 1 , & 0 , & 0 \\ 0 , & 0 , & 1 , & -1 \end{bmatrix}$$

$$D = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

۳)

$$G(S) = \frac{(K_1 \times 10 \times (-KA(1+STA)))}{(S \times (SA+10) \times (s^2 + 2\zeta sp\,\omega sp\, s + \omega sp^2) + K_1 \times 10 \times Kq)}$$

با تبدیل لاپلاس گرفتن از تابع تبدیل میتوان معادله دیفرانسیل سیستم را بدست آورد.
همچنین با انتخاب متغیرهای حالت میتوان معادله فضای حالت سیستم را نیز بدست آورد.

بونوس:

$$\dddot{y} - \ddot{y} + 3\dot{y} + 4y = 2\dddot{u} + 6\ddot{u} - \dot{u} + 3u$$

$$\xrightarrow{\text{بازنویسی}} \dddot{y} + 3\ddot{y} - \dot{y} + 4y = 2\ddot{u} + 6y' - u + 3u$$

$$\begin{cases} x_1 = y \\ x_2 = y' \\ x_3 = y'' \end{cases} \xrightarrow{\text{مشتق}} \begin{cases} x_1' = x_2 \\ x_2' = x_3 \\ x_3' = -4x_1 + x_2 - 3x_3 + 3u - u' + 6u' \end{cases}$$

$$x' = Ax + Bu$$
$$y = Cx + Du$$

$$\rightarrow x' = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & 1 & -3 \end{bmatrix} x$$