$$x_{t_v} = G_s R(s) - H_1 C(s) - H_r Y_{(s)} \quad -1$$

$$\dfrac{C(s)}{R(s)} \qquad \dfrac{C(s)}{D(s)}$$

$$x_{1(s)} = G_1 x_1(s)$$

$$x_r(s) = G_r x_r(s) + D(s)$$

$$C(s) = G_r x_r(s)$$

معادلگذاری
$C(s)$ $\longrightarrow$

$$X_r(s) = G_\tau G_1 Y_1(s) + D(s)$$

$$X_r(s) = G_r G_1 \left(G_s R(s) - H_1 \mathcal{E}C(s) \right) - H_r Y_r(s)$$

$C(s) \rightarrow$

$$G_r X_r(s) = G_r \left(G_\tau G_1 G_c X(s) \right) - G_r G_1 H_1 C(s)$$
$$- G_\tau G_1 H_r x_r(s) + D(s))$$

$$Y_r(s) = \dfrac{C(s)}{G_r}$$
$\Downarrow$

$\Longrightarrow \quad \dfrac{C(s)}{R(s)} = \dfrac{G_r G_\tau G_1 G_c}{1 + G_r G_\tau G_1 H_1 + G_r G_\tau H_r}$

$C(s)$
$1 + G_r G_\tau G H_1 + G_r G_1 H_r)$

$- G_r G_\tau G_1 G_c R(s) + G_r(DS)$

$\dfrac{C(s)}{D(s)} = \dfrac{G_r}{1 + G_r G_\tau G_1 H_1 \cancel{+G} + G_\tau G_r H_r}$

$$\left[x = [u, w, q, \theta] \quad \underset{\underbrace{y = Cx+Du}}{v = \delta_E} \quad y = [u, w, q, \theta]^T \right.$$

$$\underset{\underbrace{\dot{x} = Ax+Bu}}{}$$

حالت کلی

$$m\dot{u} =) \quad \dot{u} = a_{11} u + a_{1٢} w + a_{1٣} q + a_{1٤} \theta + b_1 \delta_e$$

$$\dot{w} =) \quad a_{٢1} u + a_{٢٢} w + a_{٢٣} q + a_{٢٤} \theta + b_٢ \delta_e$$

$$\dot{q} = a_{٣1} u + a_{٣٢} w + a_{٣٣} q + a_{٣٤} \theta + b_٣ \delta_e$$

$$\dot{\theta} = \circ \times u + \circ \times w + 1 \times q + \circ \times \theta + \circ \times \delta_e$$

ماتریس A : نسیم

$$\begin{bmatrix} a_{11} & a_{1٢} & a_{1٣} & a_{1٤} \\ a_{٢1} & a_{٢٢} & a_{٢٣} & a_{٢٤} \\ a_{٣1} & a_{٣٢} & a_{٣٣} & a_{٣٤} \\ \circ & \circ & 1 & \circ \end{bmatrix}$$

$$B = \begin{pmatrix} b_1 \\ b_٢ \\ b_٣ \\ \circ \end{pmatrix}$$

ورودی

$$C = [\circ \ \circ \ \circ \ 1]$$

برای خروجی θ

$$D = \circ$$

$$q_c(s) = \frac{k_1}{s} \left(q_c(s) - k \, f(s) \right) /$$

$$\delta E(s) = \frac{1.}{s+1.} \, f_c(s)$$

$$f(s) = \frac{-kA(1+sTA)}{s^2 + 2\xi_{sp}\omega_{sp}s + \omega^2_{sp}} \, \delta E(\omega)$$

$$q(s) = \frac{-kA(1+sTA)k_1 1.}{s(s+1.)(s^2 + 2\xi_{sp}\omega_{sp}s + \omega^2_{sp} + kA(1+sTA)k_f k_1 1.)} \, q$$

تابع انتقال

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$$s(s+1.) s^2 + 2\xi_{sp}\omega_{sp}s + \omega^2_{sp}) + kA(1+sTA) k_f k_1 1. = .$$

$$\frac{\delta^4 q}{\delta t^4} + 1. + 2\xi_{sp}\omega_{sp}) \frac{\delta^3 q}{\delta t^3} + (\omega^2_{sp} + 2.\xi_{sp}\omega_{sp}) \frac{\delta^2 f}{\delta t^2}$$

$$+ 1. \omega^2_{sp} \frac{\delta f}{\delta t} + kA k_q q_1 \frac{\delta q}{\delta t} = -kA k_1 f(4)$$

$$\dot{q} = Ax + Bu \qquad y = cx$$

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$$\dot{x}_1 = x_2 \qquad \dot{x}_2 = x_3$$

$$\dot{x}_3 = x_4$$

$$\dot{x}_4 = a_1 x_4 - a_2 x_3 - a_3 x_2 + b_1 y(4)$$

$$A = \begin{bmatrix} . & 1 & . & . \\ . & . & 1 & . \\ . & . & . & 1 \\ . & -a_3 & -a_2 & -a_1 \end{bmatrix} \qquad B = \begin{bmatrix} . \\ . \\ . \\ b \end{bmatrix} \qquad C = [1 \ . \ . \ .]$$

$$P = .$$

$$\dddot{y} - \ddot{y} + \Upsilon\dot{y} + \Im y = \Upsilon\dddot{u} + \Upsilon\ddot{u} - \Im + \Upsilon u$$

$$y = x_1 \qquad \dot{y} = x_2 \qquad \dot{x}_1 = x_2 \qquad \dot{x}_2 = -\Im x_1 - \Upsilon x_2 + \Upsilon\ddot{u}$$

$$+ \Upsilon\dot{u} - \Im + \Upsilon u$$

$$A = \begin{pmatrix} \circ & 1 \\ -\Im & -\Upsilon \end{pmatrix} \qquad B = \begin{bmatrix} \circ & \circ & \circ & \circ \\ \Upsilon & \Im & -1 & \Upsilon \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & \circ \end{bmatrix} \qquad D = \circ$$