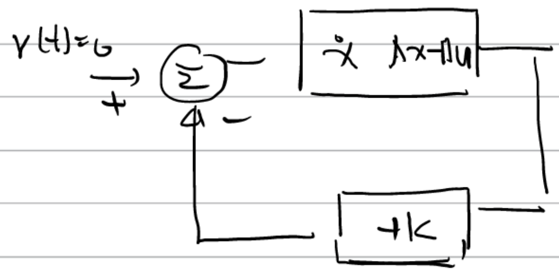
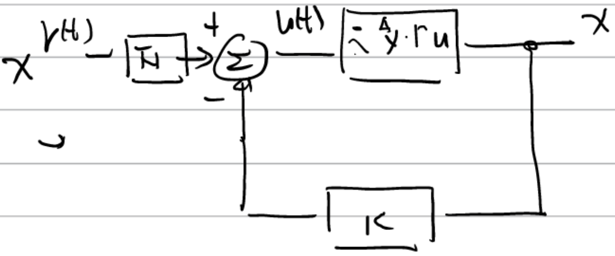
문제 8 Reference Input → Output Transfer function

문제 중복.

reference input → output.





$u(t) = \bar{N} r - Kx$ ← matrix 형태.

$$\dot{x} = Ax + Bu \xrightarrow{u = \bar{N}r - Kx} \dot{x} = Ax + B(\bar{N}r - Kx)$$

$$\dot{x} - Ax + BKx = B\bar{N}r$$

$$sX - X(0) - AX + BKX = (sI - A + BK)X = B\bar{N}r.$$

$x(0) = 0$

$$A = \begin{bmatrix} 0 & 1 \\ 4 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad C = \begin{bmatrix} 1, & 0 \end{bmatrix} \quad K = \begin{bmatrix} k_1 & k_2 \end{bmatrix}$$

$(sI - A + BK)$

$$= \begin{bmatrix} s & 0 \\ 0 & s \end{bmatrix} - \begin{bmatrix} 0 & 1 \\ 4 & 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} \begin{bmatrix} k_1 & k_2 \end{bmatrix}$$

$[2 \times 1][1 \times 2] = 2 \times 2$

$$= \begin{bmatrix} s & -1 \\ -4 & s \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ k_1 & k_2 \end{bmatrix} = \begin{bmatrix} s & -1 \\ k_1 - 4 & k_2 + s \end{bmatrix}$$

$$\frac{X}{R} = \begin{bmatrix} s & -1 \\ k_1-4 & k_2+s \end{bmatrix}^{-1} B \bar{N}$$

$$\begin{bmatrix} s & -1 \\ k_1-4 & k_2+s \end{bmatrix}^{-1} = \frac{1}{s(k_2+s)+(k_1-4)} \begin{bmatrix} k_2+s & 1 \\ -k_1+4 & s \end{bmatrix}$$

$[2\times 2] \times [2\times 1] = (2\times 1]$

$$\begin{bmatrix} k_2+s & 1 \\ -k_1+4 & s \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ s \end{bmatrix}$$

$$\frac{X}{R} = \frac{1}{s(k_2+s)+k_1-4} \begin{bmatrix} 1 \\ s \end{bmatrix} \bar{N}$$

$$y\ \cancel{y} = Cx \rightarrow \quad [1 \quad 0] \begin{bmatrix} 1 \\ s \end{bmatrix} \bar{N}$$

$$= \frac{1}{s(k_2+s)+k_1-4} \bar{N}$$

$$y = \mathcal{L}^{-1}\left\{ \frac{1}{s^2+k_2 s+k_1-4} \bar{N} \right\}$$