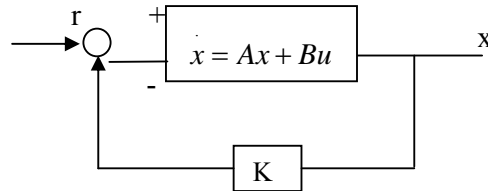


$$k \quad \dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$



$$|sI - A + BK| = s^2 + (k_2 - 2)s + 1 + k_1 = 0$$

$$(s+1)(s+2) = s^2 + 3s + 2$$

$$k_2 = 5$$

$$k_1 = 1$$

$$\dot{x} = x(t)$$

$$y(t) = 0.5x(t) + 0.5u(t)$$

A

$$g(s) = 0.5(s-1)^{-1} * 0 + 0.5 = 0.5$$

$$g(t) = \sum_{i=1}^{\infty} a^i \delta(t-i)$$

a

$$|g(t)| = \sum_{i=1}^{\infty} |a|^i (\delta - i)$$

$$\int_0^{\infty} |g(t)| dt = \sum_{i=1}^{\infty} |a|^i = \begin{cases} \infty, & \text{if } |a| \geq 1 \\ \frac{|a|}{(1-|a|)} < \infty, & \text{if } |a| < 1 \end{cases}$$

$$|a| < 1$$

k1,k2

$$G(s)H(s) = \frac{K_1(1 + K_2s)}{s(s+1)(s+2)}$$

$$(s_n - 2)^3 + 10(s_n - 2)^2 + 29(s_n - 2) + k = 0$$

$$s_n^3 + 4s_n^2 + s_n - 26 + k = 0$$

$$\begin{array}{l|ll} s^3 & 1 & 1 \\ s^2 & 4 & k - 26 \\ s^1 & \frac{30 - k}{4} & 0 \\ s^0 & k - 26 & \end{array}$$

$$s_n = \pm j \quad 4s_n^2 + 4 = 0$$

$$k=30$$

$$s = -2 \pm j \quad s = s_n - 2$$

a=-1

$$(s-1)^3 + 6(s-1)^2 + 20(s-1) + k = 0$$

$$s^3 + 3s^2 + 11s - 15 + k = 0$$

$$\begin{array}{l|ll} s^3 & 1 & 11 \\ s^2 & 3 & -15 + k \\ s & \frac{48 - k}{3} & 0 \\ 1 & -15 + k & \end{array}$$

$$48 - k > 0 \rightarrow k < 48$$

$$-15 + k > 0 \rightarrow k > 15$$

$$G(s) = \frac{k}{s(s + \sqrt{2k})}$$

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k

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$$T(s) = \frac{k}{s^2 + \sqrt{2ks} + k}$$

$$\xi = \frac{\sqrt{2}}{2}$$

$$\omega_n = \sqrt{k}$$

$$P.O. = 100e^{-\pi\xi} / \sqrt{1 - \xi^2} = \%4.3$$

k>32

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$$P.O. = 0.909(100e^{-\pi\xi} / \sqrt{1 - \xi^2}) = \%29$$

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$$G(s)H(s) = \frac{K(s+2)}{s(s-1)}$$

$$\xi = 0.707$$

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$$1 + GH(s) = 1 + \frac{k(s+2)}{s(s-1)} = 0$$

$$s^2 + (k-1)s + 2k = 0$$

$$\xi = 0.707$$

$$2\xi\omega_n = k-1, \omega_n = \sqrt{2k}$$

$$2\left(\frac{2}{\sqrt{2}}\right)\sqrt{2k} = k-1$$

$$\left(\frac{2}{\sqrt{2}}\right)^2 = \left(\frac{k-1}{\sqrt{2k}}\right)^2$$

$$k^2 - 6k + 1 = 0$$

$k=0.17$ $k=5.83$

k

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$k=5.83$

$K>1$