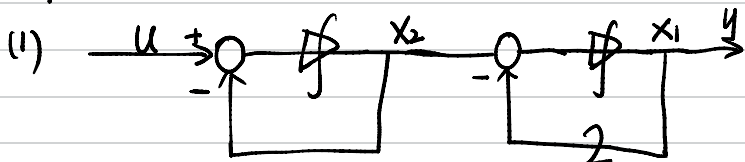


状态反馈与极点配置

1.



(2) $Q_k = [B \ AB] = \begin{bmatrix} 0 & 1 \\ 1 & -1 \end{bmatrix}$

$r(Q_k) = 2$ 完全能控
 \therefore 可以任意配置极点

(3)

$$\tilde{A} = T^{-1}AT = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

$$\tilde{b} = T^{-1}b = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\tilde{c}^T = c^T T = \begin{bmatrix} 1 & 0 \end{bmatrix}$$

$$f^*(s) = s^2 + 6s + 9 \quad f(s) = s^2 + 3s + 2$$
$$K = \begin{bmatrix} 7 & 3 \end{bmatrix}$$

$$k = K T^{-1} = \begin{bmatrix} 1 & 3 \end{bmatrix}$$

2. $Q_k = \begin{bmatrix} 1 & 3 & 7 \\ 0 & 1 & 4 \\ 1 & 4 & 9 \end{bmatrix}$ $r(Q_k) = 3$

$$\tilde{A} = T^{-1}AT = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & -3 & 3 \end{bmatrix}$$

$$\tilde{b} = T^{-1}b = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

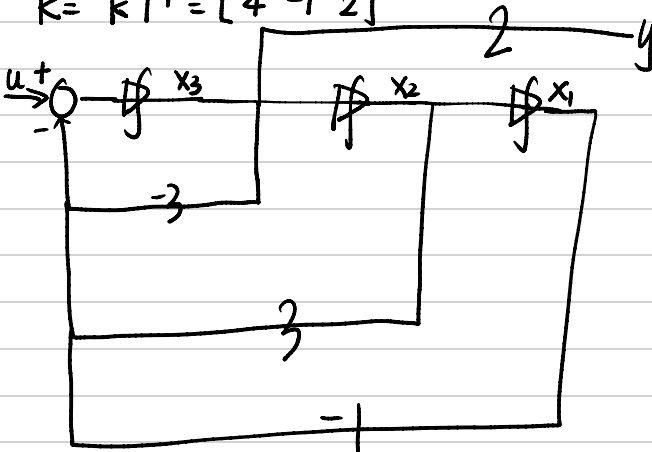
$$\tilde{c} = c^T T = [0 \ 0 \ 2]$$

$$f^*(s) = (s+1)(s+1-j)(s+1+j) \\ = s^3 + 3s^2 + 4s + 2$$

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

$$\tilde{K} = [3 \ 1 \ 6]$$

$$K = \tilde{K}T^{-1} = [4 \ -1 \ 2]$$



镇定问题

$$1. a) Q_k = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

$$r(Q_k) = 2 \neq 3$$

不完全能控

$$\text{取 } T = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

$$\text{则 } \tilde{A} = T^{-1} A T = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\tilde{B} = T^{-1} B = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

不能控部分根点为0, 不能镇定

$$b) Q_k = \begin{bmatrix} 1 & -2 \\ 1 & -2 \end{bmatrix}$$

$$\text{rank}(Q_k) = 1 \neq 2$$

系统不完全能控

$$\text{取 } T = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$$

$$\tilde{A} = T^{-1} A T = \begin{bmatrix} -2 & 1 \\ 0 & -1 \end{bmatrix}$$

$$\tilde{B} = T^{-1} B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

不能控部分根点为-1, 系统能镇定