Lect 3 Example 3-9

Q: C? O?

$$x(k+1) = \begin{bmatrix} 1 & 0.0952 \\ 0 & 0.905 \end{bmatrix} x(k) + \begin{bmatrix} 0.00484 \\ 0.0952 \end{bmatrix} u(k)$$

$$y(k) = [1\ 0]\, x(k)$$

$$u(k) = -[4.52 \quad 19.6694]\, x(k) + r(k)$$

Solution

代入 1.8

$$x(k+1) = \begin{bmatrix} 1 & 0.0952 \\ 0 & 0.905 \end{bmatrix} x(k) + \begin{bmatrix} 0.00484 \\ 0.0952 \end{bmatrix} u(k)$$

$$= \begin{bmatrix} 1 & 0.0952 \\ 0 & 0.905 \end{bmatrix} x(k) + \begin{bmatrix} 0.00484 \\ 0.0952 \end{bmatrix} \left(-[4.52 \quad 19.6694]\, x(k) + r(k) \right)$$

$$= \begin{bmatrix} 0.97812 & 0 \\ -0.4303 & -0.96753 \end{bmatrix} x(k) + \begin{bmatrix} 0.00484 \\ 0.0952 \end{bmatrix} r(k)$$

$$W_{cc} = [B_{cl} \quad A_{cl}B_{cl}]$$

$$= \begin{bmatrix} 0.00484 & 0.004734 \\ 0.0952 & -0.09419 \end{bmatrix}$$

$$|W_{cc}| = -9.07 \times 10^{-4}$$ Controllable

$$W_{ob} = \begin{bmatrix} C_{cl} \\ C_{cl}A_{cl} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0.9781 & 0 \end{bmatrix} \quad C_{cl} = C$$

$$|W_{ob}| = 0$$ unObeservable

$$\frac{Y(z)}{R(z)} = C_{cl}[zI - A_{cl}]^{-1}B_{cl}$$

$$= \frac{0.00484\,(z + 0.9876)}{(z - 0.9781)(z + 0.9876)}$$ ← 對消

$$\frac{Y(z)}{U(z)} = C(zI - A)^{-1}B = \frac{0.00484(z + 0.9876)}{(z - 1)(z + 0.905)}$$