Section 3.5

$$\underline{x} = \begin{bmatrix} s \\ \dot{s} \end{bmatrix}$$

$$\underline{x}(k+1) = \overbrace{\begin{bmatrix} 1 & T \\ 0 & 1 \end{bmatrix}}^{F} \underline{x}(k) + \overbrace{\begin{bmatrix} T^2/2 \\ T \end{bmatrix}}^{\Gamma} v(k), \quad k = 0, 1, \ldots 99$$

$$\underline{x}(0) = \begin{bmatrix} 0 \\ 10 \end{bmatrix}$$

$$E[v(k)^2] = q$$

$$z(k) = \overbrace{\begin{bmatrix} 1 & 0 \end{bmatrix}}^{H} \underline{x}(k) + w(k), \quad k = 1, 0, \ldots 100$$

$$E[w(k)^2] = r = 1$$

$$w(k) = \phi(k) + c, \quad \bar{\phi}(k) = 0, \quad E[\phi(k)^2] = r = 1$$

$$\underline{x} = \begin{bmatrix} s \\ \dot{s} \\ c \end{bmatrix}$$

① $$\underline{x}(k+1) = \overbrace{\begin{bmatrix} 1 & T & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}}^{F} \underline{x}(k) + \overbrace{\begin{bmatrix} T^2/2 \\ T \\ 0 \end{bmatrix}}^{\Gamma} v(k)$$

$$\underline{z}(k) = \overbrace{\begin{bmatrix} 1 & 0 & 1 \end{bmatrix}}^{H} \underline{x}(k) + \phi(k)$$

② observability condition: $\begin{bmatrix} H \\ HF \\ \vdots \\ HF^{n_x-1} \end{bmatrix}$ → full rank

$\begin{bmatrix} 1 & 0 & 1 \\ 1 & T & 1 \\ 1 & 2T & 1 \end{bmatrix}$ → rank $2 < n_x$ (3)

NOT observable

linearly dependent