

Office hour: Many other generatic examples are possible.
Encourage class to do Quizz examples.

$$1. \frac{Y(s)}{U(s)} = \frac{b_0}{s^2 + a_1 s + a_2} \text{ can be written as } \ddot{y} + a_1 \dot{y} + a_2 y = b_0 u$$

Choose $x_1 = y$, $x_2 = \dot{y}$ and write down for \ddot{y}

$$\text{To show } A = \begin{bmatrix} 0 & 1 \\ -a_2 & -a_1 \end{bmatrix}, B = \begin{bmatrix} 0 \\ b_0 \end{bmatrix}, C = [1 \quad 0]$$

$$2. \frac{Y(s)}{U(s)} = \frac{1}{s^4 + a_1 s^3 + a_2 s^2 + a_3 s + a_4}$$

Choose $x_1 = y$, $x_2 = \dot{y}$, $x_3 = \ddot{y}$, $x_4 = \dddot{y}$

$$\text{Show that } A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -a_4 & -a_3 & -a_2 & -a_1 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

$$3. \frac{Y(s)}{U(s)} = \frac{10}{s^4 + 2s^3 + 9s + 7}$$

$$\text{show } A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -7 & -9 & 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 10 \end{bmatrix}$$