Str 33.

(2.)

$$G(s) = \frac{6s + 14}{s^3 + 2s^2 + 5s + 9}$$

$$\frac{Y(s)}{Z(s)} = 6s + 14$$

$$\frac{Z(s)}{U(s)} = \frac{1}{s^3 + 2s^2 + 5s + 9}$$

$$U(s) = Z(s)\left(s^3 + 2s^2 + 5s + 9\right) \qquad\qquad X_1 = z'' \qquad\qquad \dot{x} = z'''$$

$$\ddot{z}''' + 2\ddot{z}'' + 5\dot{z}' + 9z = U \qquad\qquad X_2 = z' \;\;\longrightarrow\;\; \dot{x_2} = z''$$

$$z''' = -2\ddot{z}'' - 5\dot{z}' - 9z + U \qquad\qquad X_3 = z \qquad\qquad \dot{x_3} = z'$$

$$\dot{X_1} = -2X_1 - 5X_2 - 9X_3 + U$$

$$\dot{X_2} = X_1$$

$$\dot{X_3} = X_2$$

$$\begin{bmatrix} X_1' \\ X_2' \\ X_3' \end{bmatrix} = \begin{bmatrix} -2 & -5 & -9 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} U$$

$$Z(s)(6s + 14) = Y(s)$$

$$Y = 6\dot{z}' + 14z \;\;\longrightarrow\;\; Y = 6X_2 + 14X_3$$

$$Y = \begin{bmatrix} 0 & 6 & 14 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + 0 \cdot U$$