

$$y^{(3)}(t) + 3y''(t) - 2y'(t) + y(t) = \delta(t) \quad \{x_1(t), x_2(t), x_3(t)\}$$

$$\begin{array}{l|l} x_1(t) = y(t) & x_1'(t) = y'(t) \\ x_2(t) = y'(t) & x_2'(t) = y''(t) \\ x_3(t) = y''(t) & x_3'(t) = y^{(3)}(t) \end{array} \quad \begin{array}{l} \sim x_2(t) \\ \sim x_3(t) \end{array} \quad \begin{array}{l} y(0) = c_1 \\ y'(0) = c_2 \\ y''(0) = c_3 \end{array}$$

$$x_3'(t) + 3x_2'(t) - 2x_1'(t) + x_1(t) = \delta(t)$$

$$x_3'(t) + 3x_3(t) - 2x_2(t) + x_1(t) = \delta(t)$$

$$x_3'(t) = -x_1(t) + 2x_2(t) - 3x_3(t) + \delta(t)$$

$$\begin{bmatrix} x_1'(t) \\ x_2'(t) \\ x_3'(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & 2 & -3 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ x_3(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \delta(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ x_3(t) \end{bmatrix} + 0 \delta(t)$$

$$x_1(0) = c_1$$

$$x_2(0) = c_2$$

$$x_3(0) = c_3$$