$$y[n+2] + \alpha \cdot y[n+1] + \beta y[n] = u[n]$$

$$\begin{aligned} x_1[n] &= y[n] \\ x_2[n] &= y[n+1] \end{aligned} \quad \Bigg| \quad \begin{aligned} x_1[n+1] &= y[n+1] \\ x_2[n+1] &= y[n+2] \end{aligned}$$

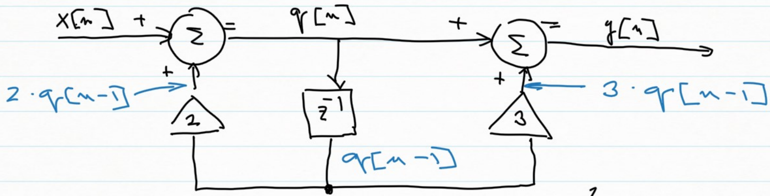
$$\begin{bmatrix} x_1[n+1] \\ x_2[n+1] \end{bmatrix} =$$

$$y[n] + \alpha \cdot y[n-1] + \beta \cdot y[n-2] = u[n]$$

$$\cancel{-\beta\, y[n-2] + \alpha \cdot y[n-1] + y[n] = u[n]}$$

$$\cancel{x_2[n]} \qquad x_1[n]$$

$$\begin{aligned} x_1[n] &= y[n-2] \\ x_2[n] &= y[n-1] \end{aligned} \quad \Bigg| \quad \begin{aligned} x_1[n+1] &= y[n-1] = x_2[n] \\ x_2[n+1] &= y[n] \end{aligned}$$



$$\{ \; y[\;] + y[\cdots\;] = x[n] \cdots$$

$$y[n] = q[n] + 3\,q[n-1]$$

$$q[n] = x[n] + 2\cdot q[n-1]$$

$$y[n] = q[n] + 3\,q[n-1] \qquad / - \qquad / \cdot 2$$

$$x[n] = q[n] - 2\,q[n-1] \qquad\qquad / \cdot 3$$

$$y[n] - x[n] = 3\,q[n-1] + 2\,q[n-1] = 5\,q[n-1]$$

- $q[n-1] = \frac{1}{5}\left(y[n] - x[n]\right)$

$$\{ \; 2x = 4, \quad x = 2$$

$$2\,y[n] = 2\cdot q[n] + 6\,q[n-1] \qquad / +$$

$$3\,x[n] = 3\,q[n] - 6\,q[n-1]$$

$$2\,y[n] + 3\,x[n] = 5\,q[n]$$

$$q[n] = \frac{2}{5}\,y[n] + \frac{3}{5}\,x[n]$$

- $q[n-1] = \frac{2}{5}\,y[n-1] + \frac{3}{5}\,x[n-1]$

$$\frac{1}{5}\left(y[n] - x[n]\right) = \frac{2}{5}\,y[n-1] + \frac{3}{5}\,x[n-1]$$

$$y[n] - 2\,y[n-1] = x[n] + 3\,x[n-1]$$

$$y[n] - a_1 y[n-1] - a_2 \cdot y[n-2] = x[n]$$

$$x_1[n] = y[n-2] \quad \Big| \quad x_1[n+1] = y[n-1] = x_2[n]$$

$$x_2[n] = y[n-1] \quad \Big| \quad x_2[n+1] = y[n]$$

$$y[n] = a_2 \cdot y[n-2] + a_1 \cdot y[n-1] + x[n]$$

$$x_1[n+1] = x_2[n]$$

$$x_2[n+1] = a_2 x_1[n] + a_1 \cdot x_2[n] + x[n]$$

$$\begin{bmatrix} x_1[n+1] \\ x_2[n+1] \end{bmatrix} = \overset{A}{\begin{bmatrix} 0 & 1 \\ a_2 & a_1 \end{bmatrix}} \begin{bmatrix} x_1[n] \\ x_2[n] \end{bmatrix} + \overset{B}{\begin{bmatrix} 0 \\ 1 \end{bmatrix}} \; u[n]$$

$$y[n] \sim a_2 x_1[n] + a_1 \cdot x_2[n] + x[n]$$

$$y[n] = \overset{C}{\begin{bmatrix} a_2 & a_1 \end{bmatrix}} \begin{bmatrix} x_1[n] \\ x_2[n] \end{bmatrix} + \overset{D}{1} \; x[n]$$