Tugas Isyarat dan Sistem

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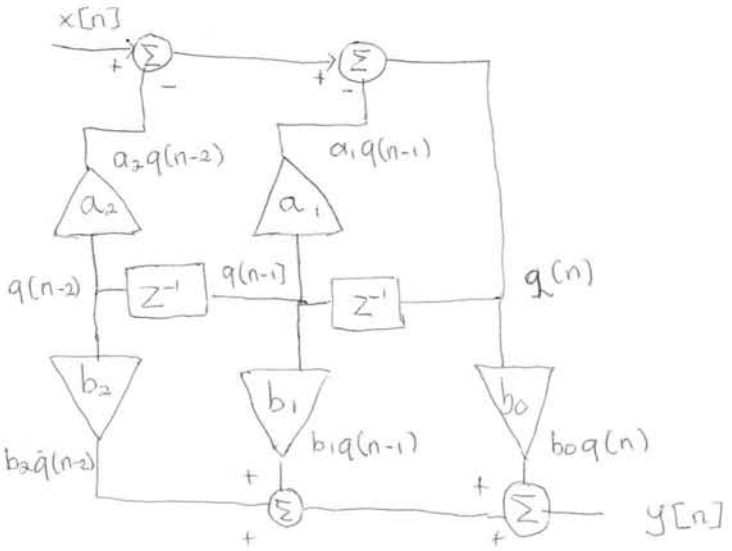
4.56 Consider the system shown in Fig. 4.10

a. Find the system function $H(z)$!

b. Find the difference equation relating the output $y[n]$ and input $x[n]$



a. $H(z) = \dfrac{Y(z)}{X(z)}$.

$$q[n] = -a_1 q(n-1) + x[n] - a_2 q[n-2]$$

$$y[n] = b_0 q(n] + b_1 q[n-1] + b_2 q(n-2]$$

→ Z transform

$$q(z) = -a_1 z^{-1} q(z) + X(z) - a_2 z^{-2} q(z)$$

$$Y(z) = b_0 q(z) + b_1 z^{-1} q(z) + b_2 z^{-2} q(z)$$

$$X(z) = q(z) + a_1 z^{-1} q(z) + a_2 z^{-2} q(z)$$

$$= q(z)\left(1 + a_1 z^{-1} + a_2 z^{-2}\right)$$

$$H(z) = \frac{Y(z)}{X(z)} = \left(\frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}}\right) \frac{Q(z)}{Q(z)}$$

$$= \frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}}$$

$$H(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}}$$

$$y(z) = x(z) \cdot h(z)$$

$$y(z) = x(z) \left(\frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}} \right)$$

$$y(z)\left(1 + a_1 z^{-1} + a_2 z^{-2}\right) = X(z)\left(b_0 + b_1 z^{-1} + b_2 z^{-2}\right)$$

$$y(z) + a_1 z^{-1} y(z) + a_2 z^{-2} y(z) = b_0 X(z) + b_1 z^{-1} x(z) + b_2 z^{-2} X(z$$

→ z^{-1} transform

$$y[n] + a_1 y[n-1] + a_2 y[n-2] = b_0 x[n] + b_1 x[n-1] + b_2 x[n-2]$$