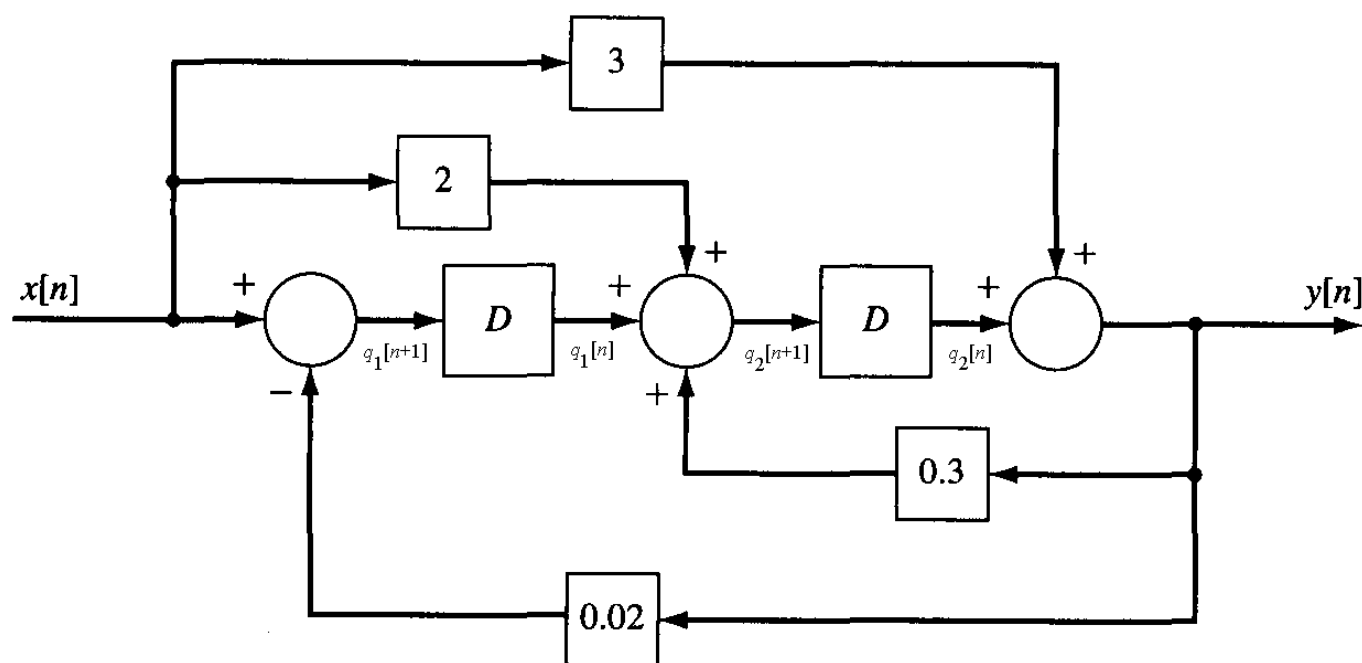


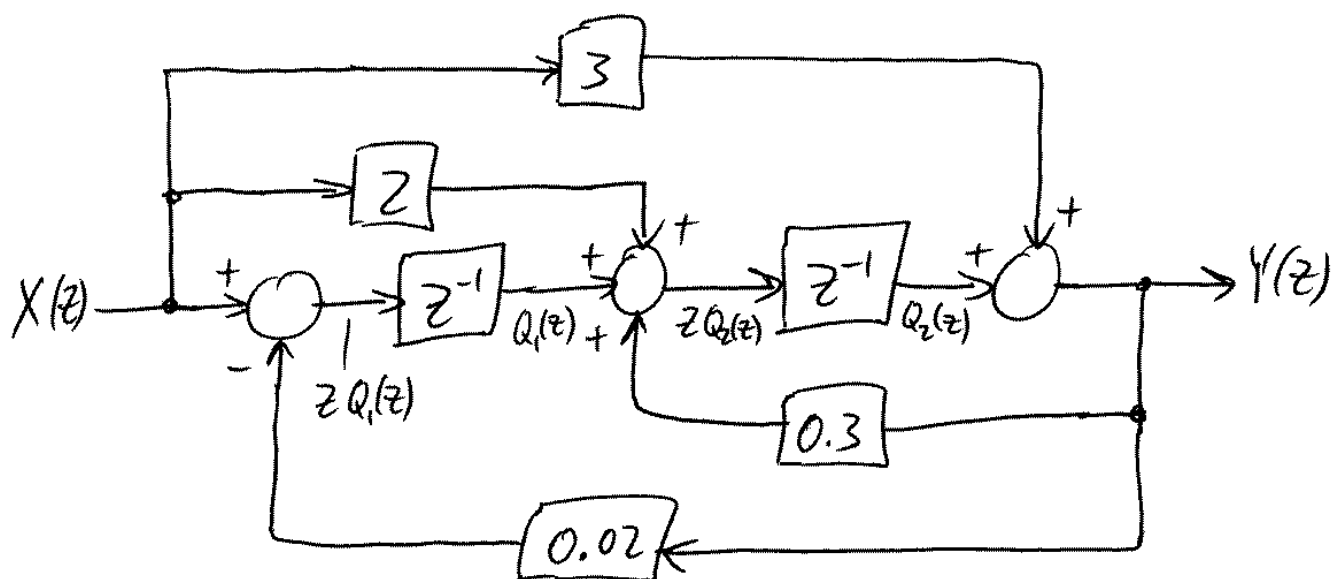
7.32 Consider the discrete-time system shown in Figure P7.32.

(a) Determine the transfer function $H(z)$ of the system.

- Draw z -domain signal flow graph (SFG) and find $H(z)$ by writing and combining output equations.



⇓ z -transform



① Input of 1st delay block $zQ_1(z) = X(z) - 0.02Y(z)$

② Input of 2nd delay block $zQ_2(z) = Q_1(z) + 2X(z) + 0.3Y(z)$

③ Output $Y(z) = Q_2(z) + 3X(z)$

Combine ② & ③ (solve for $Q_2(z)$ & substitute)

$$Y(z) = \frac{Q_1(z) + 2X(z) + 0.3Y(z)}{z} + 3X(z)$$

Substitute $Q_1(z) = \frac{X(z) - 0.02Y(z)}{z}$ from ① into above to get

$$\begin{aligned} Y(z) &= \frac{\frac{X(z) - 0.02Y(z)}{z} + 2X(z) + 0.3Y(z)}{z} + 3X(z) \\ &= \frac{X(z) - 0.02Y(z) + 2zX(z) + 0.3zY(z) + 3z^2X(z)}{z^2} \end{aligned}$$

$$z^2Y(z) + 0.02Y(z) - 0.3zY(z) = X(z) + 2zX(z) + 3z^2X(z)$$

$$\underline{\underline{H(z) = \frac{Y(z)}{X(z)} = \frac{3z^2 + 2z + 1}{z^2 - 0.3z + 0.02}}}$$