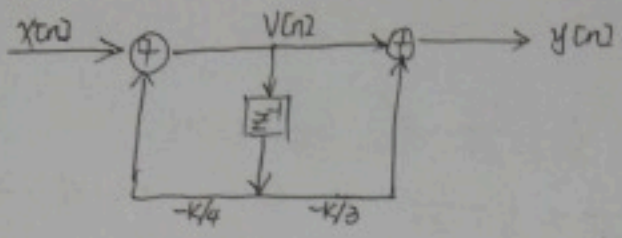
3. Solutions:



8' (a) 由方框图知:

$$V(z) = X(z) - \frac{K}{4} V(z)\cdot z^{-1} \Rightarrow \frac{V(z)}{X(z)} = \frac{1}{1+\frac{K}{4}z^{-1}}$$

$$Y(z) = V(z) - \frac{K}{3} V(z)\cdot z^{-1} \Rightarrow \frac{Y(z)}{V(z)} = \frac{1-\frac{K}{3}z^{-1}}{\cdot 1}$$

$$\therefore H(z) = \frac{Y(z)}{X(z)} = \frac{1-\frac{K}{3}z^{-1}}{1+\frac{K}{4}z^{-1}} \quad 3'$$

因 causal. $\Rightarrow$ ROC: $|z| > |\frac{K}{4}|$. 2'

Poles: $-\frac{K}{4}$.

$$\therefore y[n] + \frac{K}{4}y[n-1] = x[n] - \frac{K}{3}x[n-1] \quad 2'$$

8' (b) $$H(z) = \frac{1}{1+\frac{K}{4}z^{-1}} - \frac{K}{3}\cdot\frac{1}{1+\frac{K}{4}z^{-1}}\cdot z^{-1}, \quad |z| > \frac{|K|}{4}.$$

$$h[n] = (-\frac{K}{4})^n u[n] - \frac{K}{3}\cdot(-\frac{K}{4})^{n-1}u[n-1] \quad 5'$$

stable, $|z| > \frac{|K|}{4}$ 包含单位圆 $\Rightarrow |K| < 4$. 3'

7' (c) $K=1$, $H(z) = \frac{1-\frac{1}{3}z^{-1}}{1+\frac{1}{4}z^{-1}}$, $|z| > \frac{1}{4}$.

$$x[n] = (\frac{2}{3})^n \longrightarrow \boxed{LTI} \longrightarrow y[n] = H(z)\big|_{z=\frac{2}{3}}\cdot(\frac{2}{3})^n.$$

$$= \frac{4}{11}\cdot(\frac{2}{3})^n.$$

7' (d) $K=2$, $H(z) = \frac{1-\frac{2}{3}z^{-1}}{1+\frac{1}{2}z^{-1}}$, $|z| > \frac{1}{2}$.

$$X(z) = \frac{1}{1-\frac{2}{3}z^{-1}} \Rightarrow Y(z) = \frac{1}{1+\frac{1}{2}z^{-1}}, \quad |z| > \frac{1}{2}.$$

$|z| > \frac{2}{3}$

$$\therefore y[n] = (-\frac{1}{2})^n u[n].$$