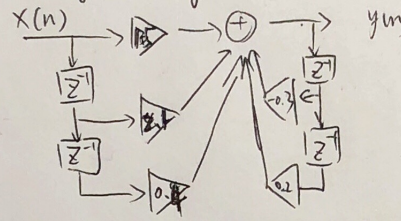
1. $H(z)=\frac{3+0.2z^{-1}+0.8z^{-2}}{2+0.6z^{-1}-0.4z^{-2}}$

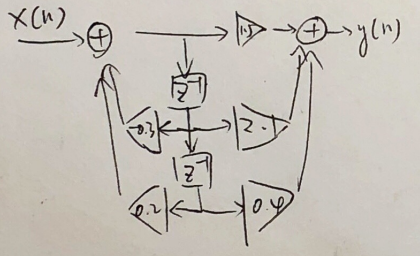
$2y(n)+0.6y(n-1)-0.4y(n-2)=3x(n)+0.2x(n-1)+0.8x(n-2)$

$y(n)=-0.3y(n-1)+0.2y(n-2)+1.5x(n)+2.1x(n-1)+0.4x(n-2)$

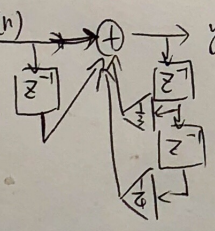
直接I型：



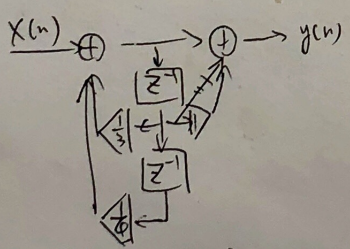
直接II型：



2. 直接I型：



直接II型



$H(\omega)=\frac{\sum_k b(k)e^{-jk\omega}}{\sum_k a(k)e^{-jk\omega}}=\frac{1+e^{-j\omega}}{1-\frac{1}{3}e^{-j\omega}-\frac{1}{6}e^{-2j\omega}}$

$|H(\omega)|=\frac{1+\cos\omega-i\sin\omega}{\cdot 1-\frac{1}{3}\cos\omega-\frac{1}{6}\cos2\omega+i(\frac{1}{3}\sin\omega+\frac{1}{6}\sin2\omega)}$

$|H(\omega)|=\frac{24|\cos\frac{\omega}{2}|}{\sqrt{169-72\cos\omega-72\cos2\omega}}$ $\arg H(\omega)=\arctan\left(-\frac{13\sin\omega+3\sin2\omega}{8+5\cos\omega-3\cos2\omega}\right)$

3. $H(z)=\frac{1+4z^{-1}}{1-0.7z^{-1}+0.1z^{-2}}=\frac{1+4z^{-1}}{(1-0.2z^{-1})(1-0.5z^{-1})}$

$=\frac{z(z+4)}{(z-0.2)(z-0.5)}$ $z^2-0.7z+0.1$

$h(n)=\sum \text{Res}[H(z)z^{n-1}]$

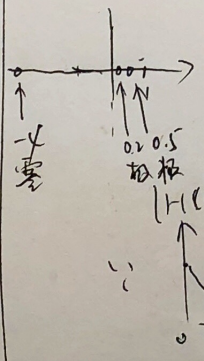
$z=0.2$: $\text{Res}=\frac{z^n(z+4)}{2z-0.7}=-14(0.2)^n$

$z=0.5$: $\text{Res}=\frac{z^n(z+4)}{2z-0.7}=15(0.5)^n$

$\therefore h(n)=15(0.5)^n u(n)-14(0.2)^n u(n)$.

$H(\omega)=\frac{1+4e^{-j\omega}}{1-0.7e^{-j\omega}+0.1e^{-2j\omega}}$

$=\frac{e^{j2\omega}(e^{j\omega}+4)}{(e^{j\omega}-0.2)(e^{j\omega}-0.5)}$



∴低通

$\because \sum_n |h(n)|=14\sum_{n=0}^{\infty}0.2^n+15\sum_{n=0}^{\infty}0.5^n<\infty$

∴ $h(n)$ 绝对可和，是稳定系统