No.

Date

数字信号处理

作业4.

1. $\begin{cases} x[n] = 0.5^n u[n] + u[-n-1] \\ y[n] = 0.75^n u[n] \end{cases}$

(1) & (2) ① $X(z) = X_1(z) + X_2(z)$

$$\begin{cases} X_1(z) = \dfrac{1}{1-0.5z^{-1}} & |z| > 0.5 \\ X_2(z) = \dfrac{-1}{1-z^{-1}} & |z| < 1 \end{cases}$$

$$\therefore X(z) = \frac{1}{1-\frac{1}{2}z^{-1}} - \frac{1}{1-z^{-1}} \quad |z| \in (\tfrac{1}{2}, 1)$$

② $Y(z) = \dfrac{1}{1-0.75z^{-1}} \quad |z| > 0.75$

$$\therefore H(z) = \frac{Y(z)}{X(z)} = \frac{-2z+3-z^{-1}}{1-0.75z^{-1}} \quad |z| \in (\tfrac{3}{4}, +\infty)$$

$$= -2z + \frac{1.5 - z^{-1}}{1-0.75z^{-1}}$$

$$= -2z + \frac{4}{3} + \frac{\frac{1}{6}}{1-0.75z^{-1}}$$

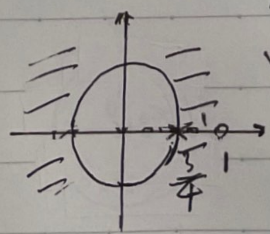
$$\therefore h[x] = -2\delta[n-1] + \frac{4}{3}\delta[n] + \frac{1}{6}(0.75)^n \cdot u[n]$$

H(z) 的零极点图

极点：$\frac{3}{4}$

零点：1

ROC：$(\frac{3}{4}, +\infty)$



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(3). 差分方程

$$H(z) = \frac{-2z+3-z^{-1}}{1-\frac{3}{4}z^{-1}} = \frac{Y(z)}{X(z)}$$

∴ 差分方程 $y[n]-\frac{3}{4}y[n-1] = -2x[n+1]+3x[n]-x[n-1]$

(4). 稳定性：稳定.

因果性：非因果.

2. $\because grd[H_{ap}(e^{j\omega})] = \frac{1-r^2}{|1-re^{j\theta}e^{-j\omega}|^2} > 0$ (4.3.5)

将 $z=1$ 代入 4.3.6 得
$(\omega=0)$

$Hap(e^{j0}) = Hap(1) = A > 0$ 常数

$\therefore arg[Hap(e^{j\omega})] = 0$.

由 $grd[Hap(e^{j\omega})] > 0$ 知. $arg[Hap(e^{j\omega})]$ 是递减函数

$\therefore arg[Hap(z)] \le 0$