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Question 3.7 ⇒ Solution of (a)

$\Rightarrow x[n] = u[-n-1] + \left(\frac{1}{2}\right)^n u[n]$

$\Rightarrow X(z) = \frac{-1}{1-z^{-1}} + \frac{1}{1-\frac{1}{2}z^{-1}} \quad \frac{1}{2} < |z| < 1$

$\Rightarrow H(z) = \frac{Y(z)}{X(z)}$

$\Rightarrow \frac{Y(z)}{X(z)} = \frac{-\frac{1}{2}z^{-1}}{(1-\frac{1}{2}z^{-1})(1+z^{-1})} \cdot \frac{(1-z^{-1})(1-\frac{1}{2}z^{-1})}{-\frac{1}{2}\cdot z^{-1}}$

$\Rightarrow \frac{1-z^{-1}}{1+z^{-1}}$

⟶ H(z) casual for ROC $|z| > 1$

Solution of (b)

X(z) is constrained by poles that are less than 1 and one of these poles cancels out the zero of H(z), which limits the region of ROC for X(z) to a certain area. Therefore, the ROC of Y(z) satisfies the conditions of $|z| > 1/2$ and $|z| > 1$ on the z plane, in addition to other two constraints. As a result, Y(z) converges for $|z| > 1$. In other words, the ROC of X(z) is limited by one of the poles of X(z) that is less than 1, canceling out the zero of H(z) in a spesific region. The ROC of Y(z) satisfies the conditions of $|z| > 1/2$ and $|z| > 1$. Result, Y(z) converges for $|z| > 1$.

Solution of (c)

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

$y[n] = -\frac{1}{3}\cdot\left(\frac{1}{2}\right)^n\cdot u[n] + \frac{1}{3}(-1)^n\cdot u[n]$

CamScanner ile tarandı

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3.17 Problem

$$y(z)\left(1-\frac{5}{2}z^{-1}+z^{-2}\right) = x(z).\left(1-z^{-1}\right)$$

$$\hookrightarrow H(z)=\frac{y(z)}{x(z)} \longrightarrow \frac{1-z^{-1}}{(1-2z^{-1}).\left(1-\frac{1}{2}z^{-1}\right)}$$

$$\hookrightarrow \frac{\frac{2}{3}}{1-2x^{-1}} + \frac{\frac{1}{3}}{1-\frac{1}{2}z^{-1}}$$

$\Rightarrow |z|<\frac{1}{2}$ $\quad h[n] = -\frac{2}{3}2^n u[-n-1] - \frac{1}{3}\left(\frac{1}{2}\right)^n.u[-n-1]$

solution of (a) $\quad h[0]=0$

$\Rightarrow \frac{1}{2}<|z|<2$ $\quad h[n] = -\frac{2}{3}2^n.u[-n-1] + \frac{1}{3}.\left(\frac{1}{2}\right)^n - u[n]$

solution of (b) $\quad h[0]=\frac{1}{3}$

$\Rightarrow |z|>2$ $\quad h[n] = \frac{2}{3}2^n.u[n] + \frac{1}{3}.\left(\frac{1}{2}\right)^n u[n]$

solution of (c) $\quad h[0]=1$

$\Rightarrow |z|>2 \;//\; |z|<\frac{1}{2}$ $\quad h[n] = \frac{2}{3}2^n.u[n] - \frac{1}{3}.\left(\frac{1}{2}\right)^n.u[n-1]$

solution of (d) $\quad h[0]=\frac{2}{3}$

Problem 3.45 (c)

The difference equation that characterizes the system

$$y[n]-\frac{3}{4}y[n-1] = x[n] - 2x[n-1]$$