

Name: Key

EE432 Fall 2011 Quiz 6

1. Using partial fraction expansion, find the inverse ZT of:

$$H(z) = \frac{0.5z(z-1)}{(z-0.25)(z+0.5)}$$

$$\frac{H(z)}{z} = \frac{0.5(z-1)}{(z-0.25)(z+0.5)} = \frac{A}{z-0.25} + \frac{B}{z+0.5}$$

$$A = \frac{0.5(z-1)}{(z-0.25)(z+0.5)} \Big|_{z=0.25} = \frac{0.5(0.25-1)}{(0.25+0.5)} = -0.5$$

$$B = \frac{0.5(z-1)}{(z-0.25)(z+0.5)} \Big|_{z=-0.5} = \frac{0.5(-0.5-1)}{(-0.5-0.25)} = 1$$

$$\frac{H(z)}{z} = \frac{-0.5}{z-0.25} + \frac{1}{z+0.5} \quad \text{so} \quad H(z) = \frac{-0.5z}{z-0.25} + \frac{z}{z+0.5}$$

$$h[n] = -0.5(0.25)^n u[n] + (-0.5)^n u[n]$$

2. Find the first 3 non-zero terms of $h[n]$ for:

$$H(z) = \frac{2}{z^2 - 0.2z + 1}$$

$$z^2 - 0.2z + 1 \overline{) \begin{array}{l} 2z^{-2} + 0.4z^{-3} - 1.92z^{-4} + \dots \\ \underline{2z^{-2} - 0.4z^{-1} + 2z^{-2}} \\ 0.4z^{-1} - 2z^{-2} \\ \underline{0.4z^{-1} - 0.08z^{-2} + 4z^{-3}} \\ -1.92z^{-2} - 0.4z^{-3} \end{array}}$$

$$H(z) = 2z^{-2} + 0.4z^{-3} - 1.92z^{-4} + \dots$$

$$h[n] = 2\delta[n-2] + 0.4\delta[n-3] - 1.92\delta[n-4] + \dots$$

Use your ZT tables to find either the ZT or the inverse ZT for:

$$H(z) = \frac{1.2z}{(z-0.6)^2} \quad |z| > 0.6$$

$$\hookrightarrow z \frac{0.6}{(z-0.6)^2} \longleftrightarrow \boxed{z \ n(0.6)^n u[n]}$$

$$\sin(0.5\pi(n-1)) u[n-1]$$

↑ delay of 1

$$\sin(0.5\pi n) u[n] \longleftrightarrow \frac{z \sin(0.5\pi)}{z^2 - 2z \cos(0.5\pi) + 1} = \frac{z}{z^2 + 1}$$

$$\sin(0.5\pi(n-1)) u[n-1]$$

↔

$$z^{-1} \left(\frac{z}{z^2 + 1} \right)$$

$$= \boxed{\frac{1}{z^2 + 1}}$$

ROC:

$$|z| > 1$$

Bonus: What country has won the most gold medals at Winter Olympic Games?

Norway