Solution to ECE Test #9 S07 #1

1. The z transform of $(0.9)^n \, u[n-3]$ can be expressed in the form $\frac{Az^a}{z-b}$. What are the numerical values of A, a and b?

$A =$ _____ , $a =$ _____ , $b =$ _____

$$(0.9)^n \, u[n-3] = 0.9^3 (0.9)^{n-3} \, u[n-3] \overset{z}{\longleftrightarrow} 0.9^3 z^{-3} \frac{z}{z-0.9} = \frac{0.729 z^{-2}}{z-0.9}$$

$$A = 0.729 \text{ , } a = -2 \text{ , } b = 0.9$$

2. What are the numerical values of the finite poles and zeros of $H(z) = \frac{z^2(z-2)}{6z^3 - 4z^2 + 3z}$?

$$H(z) = \frac{z^2(z-2)}{6z^3 - 4z^2 + 3z} = \frac{1}{6} \frac{z(z-2)}{z^2 - \frac{2}{3}z + \frac{1}{2}}$$

Zeros at $z = 0$ and $z = 2$

Poles at $z = 0.333 \pm j0.6236$

Solution to ECE Test #9 S07 #2

1. The z transform of $(0.8)^n \, u[n-2]$ can be expressed in the form $\dfrac{Az^a}{z-b}$. What are the numerical values of A, a and b?

$A =$ _____ , $a =$ _____ , $b =$ _____

$$(0.8)^n \, u[n-2] = 0.8^2 (0.8)^{n-2} \, u[n-2] \xleftrightarrow{z} 0.8^2 z^{-2} \frac{z}{z-0.8} = \frac{0.64 z^{-1}}{z-0.8}$$

$$A = 0.64 \text{ , } a = -1 \text{ , } b = 0.8$$

2. What are the numerical values of the finite poles and zeros of $H(z) = \dfrac{z^2(z-0.5)}{6z^3 - 2z^2 + 3z}$?

$$H(z) = \frac{z^2(z-0.5)}{6z^3 - 2z^2 + 3z} = \frac{1}{6} \frac{z(z-0.5)}{z^2 - \frac{1}{3}z + \frac{1}{2}}$$

Zeros at $z = 0$ and $z = 0.5$
Poles at $z = 0.1667 \pm j0.6872$

Solution to ECE Test #9 S07 #3

1. The z transform of $(0.85)^n \, u[n-1]$ can be expressed in the form $\dfrac{Az^a}{z-b}$. What are the numerical values of A, a and b?

$A =$ _____ , $a =$ _____ , $b =$ _____

$$(0.85)^n \, u[n-1] = 0.85(0.85)^{n-1} \, u[n-1] \overset{z}{\longleftrightarrow} 0.85z^{-1} \frac{z}{z-0.85} = \frac{0.85z^0}{z-0.85}$$

$$A = 0.85 \text{ , } a = 0 \text{ , } b = 0.85$$

2. What are the numerical values of the finite poles and zeros of $H(z) = \dfrac{z^2(z+0.8)}{4z^3 - 4z^2 + 3z}$?

$$H(z) = \frac{z^2(z+0.8)}{4z^3 - 4z^2 + 3z} = \frac{1}{4} \frac{z(z+0.8)}{z^2 - z + \frac{3}{4}}$$

Zeros at $z = 0$ and $z = -0.8$
Poles at $z = 0.5 \pm j0.7071$