

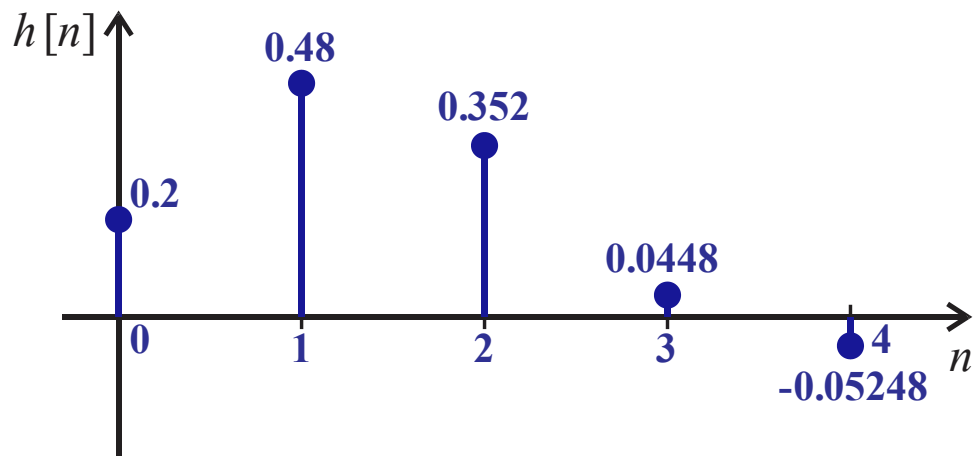
EE 313 Signals and Systems (Fall 2024) Quiz #2Name KEY AInstructions: Closed book, notes & homework. Place answers in indicated spaces & show all work for credit.

A discrete-time system, with no initial energy, is characterized by the I/O difference equation

$$y[n] - 0.4y[n-1] + 0.2y[n-2] = 0.2x[n] + 0.4x[n-1] + 0.2x[n-2].$$

Calculate and sketch a stem plot of the unit pulse response $h[n]$ of this system for $0 \leq n \leq 4$. Label each stem with the appropriate value of $h[n]$.Let $x[n] = \delta[n]$ and $y[n] = h[n]$.Note that both $\delta[n] = 0$ and $h[n] = 0$ for $n < 0$ (causal and no initial energy).Put in recursive form $h[n] = 0.4h[n-1] - 0.2h[n-2] + 0.2\delta[n] + 0.4\delta[n-1] + 0.2\delta[n-2]$.

$n = 0$	$h[0] = 0.4h[0-1] - 0.2h[0-2] + 0.2\delta[0] + 0.4\delta[0-1] + 0.2\delta[0-2]$ $= 0.4(0) - 0.2(0) + 0.2(1) + 0.4(0) + 0.2(0) \Rightarrow \underline{h[0] = 0.2}$
$n = 1$	$h[1] = 0.4h[1-1] - 0.2h[1-2] + 0.2\delta[1] + 0.4\delta[1-1] + 0.2\delta[1-2]$ $= 0.4(0.2) - 0.2(0) + 0.2(0) + 0.4(1) + 0.2(0) \Rightarrow \underline{h[1] = 0.48}$
$n = 2$	$h[2] = 0.4h[2-1] - 0.2h[2-2] + 0.2\delta[2] + 0.4\delta[2-1] + 0.2\delta[2-2]$ $= 0.4(0.48) - 0.2(0.2) + 0.2(0) + 0.4(0) + 0.2(1) \Rightarrow \underline{h[2] = 0.352}$
$n = 3$	$h[3] = 0.4h[3-1] - 0.2h[3-2] + 0.2\delta[3] + 0.4\delta[3-1] + 0.2\delta[3-2]$ $= 0.4(0.352) - 0.2(0.48) + 0.2(0) + 0.4(0) + 0.2(0) \Rightarrow \underline{h[3] = 0.0448}$
$n = 4$	$h[4] = 0.4h[4-1] - 0.2h[4-2] + 0.2\delta[4] + 0.4\delta[4-1] + 0.2\delta[4-2]$ $= 0.4(0.0448) - 0.2(0.352) + 0.2(0) + 0.4(0) + 0.2(0) \Rightarrow \underline{h[4] = -0.05248}$



EE 313 Signals and Systems (Fall 2024) Quiz #2Name KEY BInstructions: Closed book, notes & homework. Place answers in indicated spaces & show all work for credit.

A discrete-time system, with no initial energy, is characterized by the I/O difference equation

$$y[n] + 0.4 y[n-1] + 0.2 y[n-2] = 0.4 x[n] + 0.8 x[n-1] + 0.4 x[n-2].$$

Calculate and sketch a stem plot of the unit pulse response $h[n]$ of this system for $0 \leq n \leq 4$. Label each stem with the appropriate value of $h[n]$.Let $x[n] = \delta[n]$ and $y[n] = h[n]$.Note that both $\delta[n] = 0$ and $h[n] = 0$ for $n < 0$ (causal and no initial energy).Put in recursive form $h[n] = -0.4 h[n-1] - 0.2 h[n-2] + 0.4 \delta[n] + 0.8 \delta[n-1] + 0.4 \delta[n-2]$.

$n = 0$	$h[0] = -0.4 h[0-1] - 0.2 h[0-2] + 0.4 \delta[0] + 0.8 \delta[0-1] + 0.4 \delta[0-2]$ $= -0.4(0) - 0.2(0) + 0.4(1) + 0.8(0) + 0.4(0) \Rightarrow \underline{h[0] = 0.4}$
$n = 1$	$h[1] = -0.4 h[1-1] - 0.2 h[1-2] + 0.4 \delta[1] + 0.8 \delta[1-1] + 0.4 \delta[1-2]$ $= -0.4(0.4) - 0.2(0) + 0.4(0) + 0.8(1) + 0.4(0) \Rightarrow \underline{h[1] = 0.64}$
$n = 2$	$h[2] = -0.4 h[2-1] - 0.2 h[2-2] + 0.4 \delta[2] + 0.8 \delta[2-1] + 0.4 \delta[2-2]$ $= -0.4(0.64) - 0.2(0.4) + 0.4(0) + 0.8(0) + 0.4(1) \Rightarrow \underline{h[2] = 0.064}$
$n = 3$	$h[3] = -0.4 h[3-1] - 0.2 h[3-2] + 0.4 \delta[3] + 0.8 \delta[3-1] + 0.4 \delta[3-2]$ $= -0.4(0.064) - 0.2(0.64) + 0.4(0) + 0.8(0) + 0.4(0) \Rightarrow \underline{h[3] = -0.1536}$
$n = 4$	$h[4] = -0.4 h[4-1] - 0.2 h[4-2] + 0.4 \delta[4] + 0.8 \delta[4-1] + 0.4 \delta[4-2]$ $= -0.4(-0.1536) - 0.2(0.064) + 0.4(0) + 0.8(0) + 0.4(0) \Rightarrow \underline{h[4] = 0.04864}$

