ECE113: DSP

Homework 5

Due 05/14/2021, 11:59pm

Problem 1: Problem 7.4 in R1

Problem 2: Problem 7.8 in R1

Problem 3: Problem 7.9 in R1

Problem 4: Problem 8.13 in R1

Problem 5: Problem 8.17 in R1

Problem 6: Problem 3.2 ((b) and (h) only) in R1

Problem 7: Problem 3.4 ((b) only) in R1

Problem 8: Problem 3.8 in R1

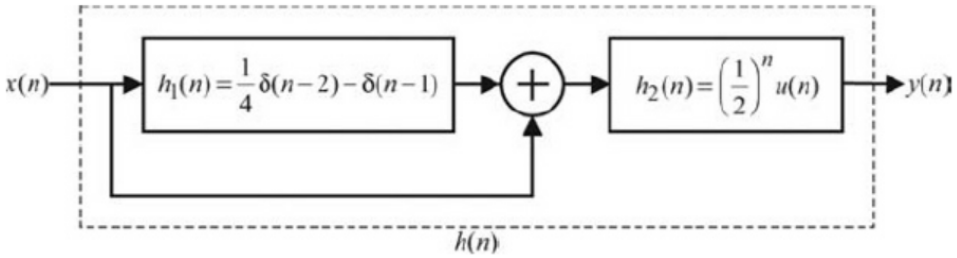
Problem 9: Problem 3.9 in R1

Problem 10:

Consider the system shown below.

1. Using the z-transform approach, show that the impulse response, $h(n)$, of the overall system is given by

$$h(n) = \delta(n) - \frac{1}{2}\delta(n-1)$$



2. Determine the difference equation representation of the overall system that relates the output $y(n)$ to the input $x(n)$.
3. Is this system causal? BIBO stable? Explain clearly to receive full credit.
4. Determine the frequency response $H(e^{j\omega})$ of the overall system.
5. Using MATLAB, provide a plot of this frequency response over $0 \leq \omega \leq \pi$.

MATLAB:

For this HW, you do not need to submit anything. But this would be a very good exercise for you to better understand the importance of frequency-domain signal analysis in practice (with an audio signal used as an example), and appreciate the significance of the information contained in the magnitude and the phase of the frequency spectrum.

In MATLAB, please run the following command:

```
openExample('signal/FrequencyAnalysisExample')
```

And carefully read all of the text (you can also read it here: https://www.mathworks.com/help/signal/examples/practical-introduction-to-frequency-domain-analysis.html).

Then please run the code, and generate all the plots for yourself. You may want to place breakpoints and step through the code and try to understand what is happening at every step.