Full Name: _____ **ExamID: 000000**

EEL 4750 / EEE 5502 (Fall 2018) – Practice Exam #01 **Date: Sept. 25, 2018**

Question	# of Points Possible	# of Points Obtained	Grader
# 1	17		
# 2	16		
# 3	18		
# 4	18		
# 5	16		
# 6	14		
Total	100		

For full credit when sketching: remember to label axes and make locations and amplitudes clear.

Before starting the exam, read and sign the following agreement.

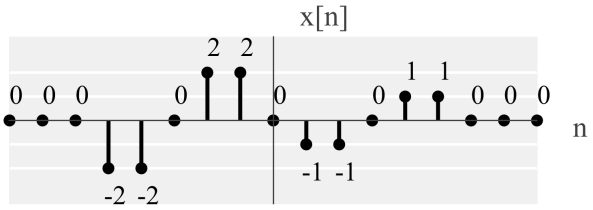
By signing this agreement, I agree to solve the problems of this exam while adhering to the policies and guidelines of the University of Florida and EEL 4750 / EEE 5502 and without additional external help. The guidelines include, but are not limited to,

- Only one 8.5 by 11 inch cheat sheet (double-sided) may be used
- No calculators or computers may be used
- No textbooks or additional notes may be used
- No collaboration is allowed
- No cheating is allowed

_____ _____

Student Date

Question #1: Consider the discrete-time signal $x[n]$ below.



(a) *(4 pts)* Sketch $x[-2-n]$ Remember to label your axes.

(b) *(4 pts)* Sketch $2x[n] + x[n-3]$ Remember to label your axes.

(c) *(4 pts)* Is the signal $x[n]$ causal, anti-causal, or neither? **Briefly justify why.**

(d) *(5 pts)* Is $x[n]$ an energy signal, a power signal, or neither? If $x[n]$ is an energy signal, compute its energy. If $x[n]$ is a power signal, compute its power. If $x[n]$ is neither, explain why.

Question #2: Let the discrete-time signal $z[n]$ defined by

$$z[n] = 3\left[\sum_{m=-\infty}^{\infty} \delta[n-(3m+1)] - \delta[n-(3m+2)]\right]$$

(a) *(6 pts)* Sketch $z[n]$ for $-6 \leq n \leq 6$. Remember to label your axes.

(b) *(5 pts)* Is the signal $z[n] + z[-n]$ even, odd, or neither? **Briefly justify why.**

(c) *(6 pts)* Is $z[n]$ an energy signal, a power signal, or neither? If $z[n]$ is an energy signal, compute its energy. If $z[n]$ is a power signal, compute its power. If $z[n]$ is neither, explain why.

Question #3: Consider the discrete-time system expressed by the input-output relationship

$$y[n] = \sum_{m=-\infty}^{n} m\, e^{x[n]}$$

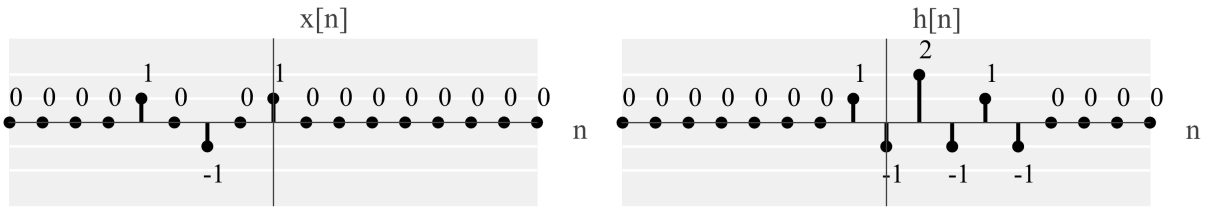
(a) *(5 pts)* Is this system linear? **Justify why.**

(b) *(5 pts)* Is this system time-invariant? **Justify why.**

(c) *(4 pts)* Is this system causal? **Justify why.**

(d) *(4 pts)* Is this system memoryless? **Justify why.**

Question #4: Consider a discrete-time input $x[n]$ and impulse response $h[n]$.



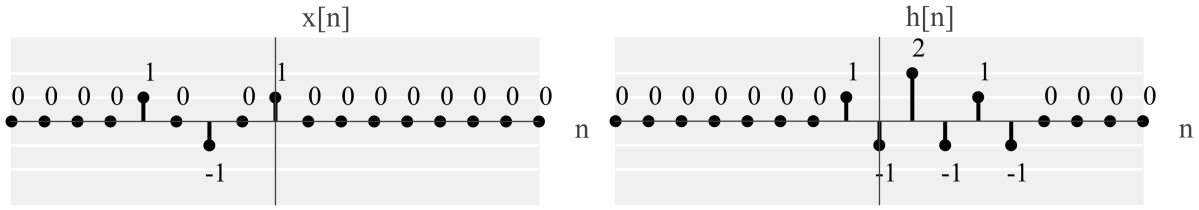
(a) *(3 pts)* Express $h[n]$ as a sum of impulse signals.

(b) *(3 pts)* Is the system with impulse response $h[n]$ causal?

(c) *(5 pts)* Sketch the output $y[n]$ (for $n = -8$ to $n = 8$) of the discrete-time, LTI system

$$y[n] = x[n] * (3\delta[n-2])$$

Consider a discrete-time input $x[n]$ and impulse response $h[n]$.



(d) *(7 pts)* Sketch the output $y[n]$ (for $n = -8$ to $n = 8$) of the discrete-time, LTI system

$$y[n] = x[n] * h[n]$$

Question #5: Answer the following questions.

(a) *(5 pts)* Determine the transfer function $H(z)$ for the given difference equation

$$0 = x[n-10] + x[n-15] - y[n-10] - y[n-15]$$

(b) *(6 pts)* Compute the impulse response $h[n]$ for the given difference equation

$$y[n+10] = (1/4)y[n+9] + 2x[n+10]$$

(c) *(5 pts)* Determine the inverse discrete-time Fourier Transform (DTFT) of $H(\omega)$ such that

$$H(\omega) = \frac{1-(1/2)e^{-j\omega}}{1+(1/2)e^{-j\omega}}$$

Question #6: Consider the z-transforms $H_1(z)$ and $H_2(z)$ below.

$$H_1(z) = \frac{4}{2 - z^{-1}} \quad , \quad H_2(z) = \frac{1 + 2z^{-1}}{1 + 4z^{-2}} + \frac{1}{1 - 2z^{-1}}$$

(a) *(5 pts)* Compute the inverse z-transform of the $H_1(z)$ such that the system is **causal**. Is the system **stable**?

(b) *(9 pts)* Sketch the pole-zero plot and the region-of-convergence for $H_2(z)$. Assume $H_2(z)$ is **stable**. Is the system **causal**, **anti-causal**, or **neither**?