

October 6, 2008
Midterm Exam I
EE 3302: Signals and Systems

NOTE: Please, complete the following table and keep record of your assignment number.

First Name	
Last Name	
Student ID	
Assignment #	0

Exercise 1. Consider the discrete-time signal

$$x[n] = (n - 3)(u[n] - u[n - 7])$$

where $u[n]$ is the causal unit step function.

A) Sketch and label carefully $x[n]$ [pt. 10].

Exercise 2. Consider the continuous-time signal

$$x(t) = \begin{cases} \sqrt{t} & -2 \leq t \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

A) Derive the energy and the time-averaged power of signal $x(t)$ over $-\infty < t < \infty$ [pt. 10].

Exercise 3. A continuous-time LTI system has impulse response

$$h(t) = \begin{cases} -e^t & 2 < t < 100 \\ 0 & \text{otherwise} \end{cases}$$

A) Determine whether or not the system is [pt. 10]:

- memoryless,
- causal,
- stable.

Exercise 4. Consider the continuous-time LTI system with the following input (x) output (y) relation

$$y(t) = \int_{t-4}^{\infty} 3 x(\tau) d\tau - x(t-1)$$

A) Derive, sketch and label the impulse response of the system, i.e., $h(t)$, and determine whether or not the system is stable [pt. 15].

Exercise 5. Consider the discrete-time LTI system with impulse response

$$h[n] = \begin{cases} 2 & n \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

The signal at the system input is

$$x[n] = \delta[n+2] + \delta[n] - \delta[n-2]$$

where $\delta[n]$ is the unit impulse function.

- A)** Derive the expression of the signal at the output of the system, i.e., $y[n]$. Sketch and label carefully $y[n]$.
Give your descriptive interpretation of the LTI system with impulse response $h[n]$ [pt. 20].

Exercise 6. The unit impulse response of a continuous-time LTI system is

$$h(t) = \begin{cases} 1 & 0 < t < 2 \\ 0 & \text{otherwise} \end{cases}$$

The signal at the system input is

$$x(t) = \begin{cases} 3 & -2 < t < 0 \\ -3 & 0 < t < 2 \\ 0 & \text{otherwise} \end{cases}$$

- A)** Derive the expression of the signal at the output of the system, i.e., $y(t)$. Sketch and label carefully $y(t)$ [pt. 20].