EE 315 Quiz 1
Spring 2005

February 18, 2005

Name: _____

Problem Number	Maximum Points	Your Score
1	15	
2	12	
3	18	
4	15	
Total	60	

(1) All parts are independent.
(a) (6) Consider the continuous-time system $y(t) = x(-t)$. Determine whether or not the system is (i) time-invariant, (ii) causal.

(b) (3) Consider the discrete-time system $y[n] = x[n] + 2$. Is this system linear? Justify your answer.

(c) (6) Consider the linear, time-invariant discrete-time system where the impulse response is $(2\alpha)^n u[n-2]$ and the input is $x[n] = u[n-3]$. Under what conditions is this system stable? Justify your answer. Determine the output $y[n]$.

(2) (12) Consider a continuous-time, linear, and time-invariant system where the input is

$$x(t) = \begin{cases} t+1 & \text{for } \ 0 \leq t \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

and the impulse response is $h(t) = u(t+1) - u(t-1)$. Determine the output $y(t)$. You may leave your expressions for $y(t)$ in terms of correct and specific definite integrals and receive full credit.

(3) Parts (a) and (b) are independent.
(a) (9) Consider a discrete-time LTI system where the impulse response and the input are $h[n] = x[n] = u[n-1] - u[n-3]$. Determine and sketch the output $y[n]$.

(b) Let $x[n]$ be a periodic, discrete-time signal with period N. Determine whether or not the signals $y[n]$ below are periodic and let M denote its period. If so, determine M. Consider various cases for N. Justify your answers.
(i) (3) $y[n] = x[n/2]$ if n is even and $y[n] = 0$ if n is odd.
(ii) (6) $y[n] = x[n-1]$ if n is even and $y[n] = 0$ if n is odd.

(4) Parts (a) and (b) are independent.
(a) (9) Consider the continuous-time periodic signal

$$x(t) = 3 + \cos\left(\frac{5\pi}{3}t\right) + \sin\left(\frac{\pi}{3}t\right).$$

Find the Fourier series coefficients of $x(t)$.

(b) (6) Let $x(t)$ be a periodic signal with fundamental period T and Fourier series coefficients a_k. Let $y(t) = \mathcal{O}\{x(t)\}$ be the odd part of $x(t)$ and let b_k denote the FS coefficients of $y(t)$. Derive the relationship between the Fourier series coefficients b_k and the FS coefficients a_k.