

**Assignment #2 CE242 : Signals & Systems**  
**Dept. of Computer Engineering**  
**Sharif University of Technology**  
**Fall 2006**

Distributed : 7/25

Due: 8/7

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**1)** For the following discrete-time and continuous-time LTI systems, determine whether each system is causal and/or stable. Justify your answers.

(a)  $h_n = \left(\frac{1}{2}\right)^n u_{-n}$

(b)  $h_n = \left(-\frac{1}{2}\right)^n u_n + (1.01)^n u_{n-1}$

(c)  $h(t) = e^{2t} u(-1 - t)$

(d)  $h(t) = te^{-t} u(t)$

**2)** Let  $x[n]$  be a signal which is nonzero only in the interval  $0 \leq n < M$  and  $h[n]$  be a signal which is nonzero only in the interval  $0 \leq n < N$ .

(a) Determine the interval  $L_1 \leq n \leq L_2$  over which  $y[n] = x[n] * h[n]$  is nonzero. Express  $L_1$  and  $L_2$  in terms of  $M$  and  $N$ .

(b) Verify the result in the the previous part by analytically computing the convolution of the signals  $x[n] = u[n] - u[n-5]$  and  $h[n] = 2(u[n] - u[n-3])$ .

(c) Verify the result in the the previous part by graphically computing the convolution of the signals  $x[n] = u[n] - u[n-5]$  and  $h[n] = 2(u[n] - u[n-2])$ .

**3)** Draw block diagram representations for casual LTI systems described by the following equations:

(a)  $y[n] + \frac{1}{2} y[n-1] - \frac{1}{4} y[n-2] = x[n] + 2 x[n-1]$

(b)  $y''(t) + 5 y'(t) + 4 y(t) = x'(t)$

(c)  $y'''(t) + 2 y'(t) + 3 y(t) = x(t) + 3 x'(t)$

**4)** Problem 2.17 of the textbook.

**5)** Problem 2.25 of the textbook.

**6)** Problem 2.46 of the textbook.