Signals and Systems (CT 203)

<u>Tutorial Sheet-04 DA-IICT, Gandhinagar.</u>

1. Using the definition of linearity, show that the ideal delay system and moving average (MA) system are both linear systems.

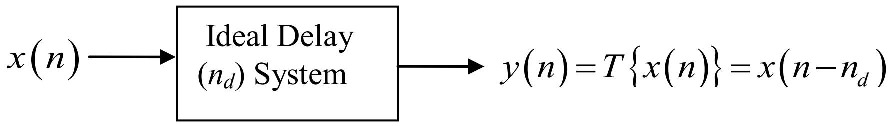

Fig.1a. Ideal Delay System

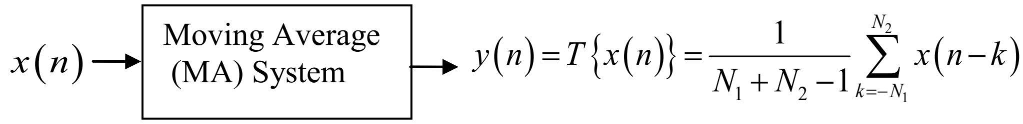

Fig.1b. Moving Average (MA) System

2. For each of the following systems, determine whether the system is

   - Stable
   - Causal
   - linear
   - time-invariant
   - memoryless

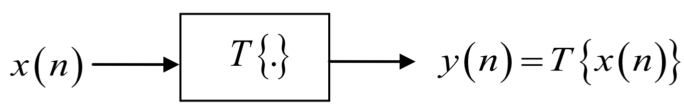

Fig.2. Discrete-time system

(a) $y(n)=T\{x(n)\}=g(n)x(n)$

(b) $y(n)=T\{x(n)\}=\sum_{k=n_o}^{n} x(k)$

(c) $y(n)=T\{x(n)\}=e^{x(n)}$

(d) $y(n)=T\{x(n)\}=ax(n)+b$

3. Let $x(n)=\delta(n)+2\delta(n-1)-\delta(n-3)$ and $h(n)=2\delta(n+1)+2\delta(n-1)$.
   Compute and plot each of the following convolutions.

(a) $y_1(n)=x(n)*h(n)$

(b) $y_2(n)=x(n+2)*h(n)$

(c) $y_3(n)=x(n)*h(n+2)$

4. Evaluate the integral $\int_0^{\infty} \delta(t + \frac{3}{4}) e^{-t} dt$ (Hint:- Use properties of impulse signal)

5. For each of the following input-output relationships, determine weather the corresponding system is linear, time invariant or both.

   A) $y(t) = t^2 x(t-1)$
   B) $y[n] = x^2[n-2]$

6. Prove that the system given by the following input-output (I/O) is nonlinear.

$$y[n] = T\{x[n]\} = x^*[n]$$