**Note: For this assignment, your Handwritten, hard-copy solution is due on or before October 8th, 2012.**

**Question No. 1**

Sketch the following sequences:

1. $x\left(n\right)=3δ\left(n+2\right)-0.5δ\left(n\right)+5δ\left(n-1\right)-4δ(n-5)$
2. $x\left(n\right)=δ\left(n+1\right)-2δ\left(n-1\right)+5u(n-4)$

**Question No. 2**

Determine which of the following is a linear system:

1. $y\left(n\right)=5x\left(n\right)+2x^{2}(n)$
2. $y\left(n\right)=x\left(n-1\right)+4x(n)$
3. $y\left(n\right)=4x^{3}\left(n-1\right)-2x(n)$

**Question No. 3**

Given the following linear systems, find which one is time invariant:

1. $y\left(n\right)=-5x\left(n-10\right)$
2. $y\left(n\right)=4x\left(n^{2}\right)$

**Question No. 4**

Determine which of the following linear systems is causal:

1. $y\left(n\right)=0.5x\left(n\right)+100x\left(n-2\right)-20x(n-10)$
2. $y\left(n\right)=x\left(n+4\right)+0.5x\left(n\right)-2x(n-2)$

**Question No. 5**

Determine causality for each of the following linear systems:

1. $y\left(n\right)=0.5x\left(n\right)+20x\left(n-2\right)-0.1x(n-1)$
2. $y\left(n\right)=x\left(n+2\right)-0.4x(n-1)$
3. $y\left(n\right)=x\left(n-1\right)+0.5x(n+2)$

**Question No. 6**

Find the unit-impulse response for each of the following linear systems:

1. $y\left(n\right)=0.5x\left(n\right)-0.5x\left(n-2\right); for n\geq 0,x\left(-2\right)=0, x\left(-1\right)=0$
2. $y\left(n\right)=0.75y\left(n-1\right)+x\left(n\right); for n\geq 0,y\left(-1\right)=0,$
3. $y\left(n\right)=-0.8y\left(n-1\right)+x\left(n-1\right); for n\geq 0,x\left(-1\right)=0, y\left(-1\right)=0$

**Question No. 7**

Determine stability for the following linear system:

$$y\left(n\right)=0.5x\left(n\right)+100x\left(n-2\right)-20x(n-10)$$

**Question No. 9**

Determine stability for each of the following linear systems:

1. $y\left(n\right)=\sum\_{k=0}^{\infty }0.75^{k}x(n-k)$
2. $y\left(n\right)=\sum\_{k=0}^{\infty }2^{k}x(n-k)$

**Question No. 10**

Given the sequence

$$h\left(k\right)=\left\{\begin{matrix}2,&k=0,1,2\\1,&k=3,4\\0&elsewhere\end{matrix}\right.$$

where$ k$ is the time index or sample number.

1. Sketch the sequence$ h(k)$ and the reverse sequence$ h(-k)$.
2. Sketch the shifted sequences$ h(-k+2)$ and$ h(-k-3)$.

**Question No. 11**

Using the following sequence definitions

$h\left(k\right)=\left\{\begin{matrix}2,&k=0,1,2\\1,&k=3,4\\0&elsewhere\end{matrix}\right.$ and $x\left(k\right)=\left\{\begin{matrix}2,&k=0,\\1,&k=1,2\\0&elsewhere\end{matrix}\right.$

evaluate the digital convolution

$$y\left(n\right)=\sum\_{k=-\infty }^{\infty }x\left(k\right)h(n-k)$$

1. using the graphical method;
2. using the table method;
3. applying the convolution formula directly.

**Question No. 12**

Given the sequence definitions

$x\left(k\right)=\left\{\begin{matrix}-2,&k=0,1,2\\1,&k=3,4\\0&elsewhere\end{matrix}\right.$ and $h\left(k\right)=\left\{\begin{matrix}2,&k=0,\\-1,&k=1,2\\0&elsewhere\end{matrix}\right.$

evaluate the digital convolution

$$y\left(n\right)=\sum\_{k=-\infty }^{\infty }h\left(k\right)x(n-k)$$

1. using the graphical method;
2. using the table method;
3. applying the convolution formula directly.