**Note: For this assignment, your Handwritten, hard-copy solution is**

**due on or before November 21st, 2012.**

**Question No. 1**

Find the z-transform for each of the following sequences (from the definition of the z-transform),

1. $x\left(n\right)=4 u(n)$
2. $x\left(n\right)=\left(-0.7\right)^{n} u(n)$
3. $x\left(n\right)=4 e^{-2n} u(n)$
4. $x\left(n\right)=4 \left(0.8\right)^{n}\cos(\left(0.1πn\right)) u\left(n\right)$
5. $x\left(n\right)=4 e^{-3n} \sin(\left(0.1πn\right)) u\left(n\right)$

**Question No. 2**

Using the properties of the z-transform, find the z-transform for each of the following sequences

1. $x\left(n\right)=u\left(n\right)+\left(0.5\right)^{n} u(n)$
2. $x\left(n\right)= e^{-3(n-4)} \cos(\left(0.1π\left(n-4\right)\right)) u\left(n-4\right)$,

where$ u\left(n-4\right)=1$ for$ n\geq 4$ and $u\left(n-4\right)=0$ for$ n<4$.

**Question No. 3**

Given two sequences

$$x\_{1}\left(n\right)=5 δ\left(n\right)-2 δ\left(n-2\right)$$

$$x\_{2}\left(n\right)=3 δ\left(n-3\right)$$

1. determine the z-transform of convolution of the two sequences using the convolution property of the z-transform,

$$X\left(z\right)=X\_{1}\left(z\right)X\_{2}\left(z\right)$$

1. determine convolution by the inverse z-transform from the result in part (a),

$$x\left(n\right)=Z^{-1}\left(X\_{1}\left(z\right)X\_{2}\left(z\right)\right)$$

**Question No. 4**

Using the Table 5.1 and z-transform properties, find the inverse z-transform for each of the following functions,

1. $X\left(z\right)=4-\frac{10z}{z-1}-\frac{z}{z+0.5}$
2. $X\left(z\right)=\frac{-5z}{\left(z-1\right)}+\frac{10z}{\left(z-1\right)^{2}}+\frac{2z}{\left(z-0.8\right)^{2}}$
3. $X\left(z\right)=\frac{z}{z^{2}+1.2z+1}$
4. $X\left(z\right)=\frac{4z^{-4}}{z-1}+\frac{z^{-1}}{\left(z-1\right)^{2}}+z^{-8}+\frac{z^{-5}}{z-0.5}$

**Question No. 5**

Using the partial fraction expansion method and Table 5.1, find the inverse z-transform for each of the following functions,

1. $X\left(z\right)=\frac{1}{z^{2}-0.3z-0.04}$
2. $X\left(z\right)=\frac{2}{\left(z-0.2\right)\left(z+0.4\right)}$
3. $X\left(z\right)=\frac{z}{\left(z+0.2\right)\left(z^{2}-z+0.5\right)}$
4. $X\left(z\right)=\frac{z(z+0.5)}{\left(z-0.1\right)^{2}\left(z-0.6\right)}$

**Question No. 6**

A system is described by the difference equation

$$y\left(n\right)+0.5y\left(n-1\right)=2 \left(0.8\right)^{n}u\left(n\right)$$

determine the solution when the initial condition is$ y\left(-1\right)=2$.

**Question No. 7**

A system is described by the difference equation

$$y\left(n\right)-0.5y\left(n-1\right)+0.06 y\left(n-2\right)=\left(0.4\right)^{n-1}u\left(n-1\right)$$

determine the solution when the initial condition are$ y\left(-1\right)=1$ and$ y\left(-2\right)=2$.

**Question No. 8**

Given the following difference equation with the input-output relationship of a certain initially relaxed system (all initial conditions are zero),

$$y\left(n\right)-0.7y\left(n-1\right)+0.1 y\left(n-2\right)=x\left(n\right)+x\left(n-1\right)$$

1. find the impulse response sequence$ y\left(n\right)$ due to the impulse sequence$ δ\left(n\right)$.
2. find the output response of the system when the unit step function$ u\left(n\right)$ is applied.

**Question No. 9**

Given the following difference equation with the input-output relationship of a certain initially relaxed DSP system (all initial conditions are zero),

$$y\left(n\right)-0.4y\left(n-1\right)+0.29 y\left(n-2\right)=x\left(n\right)+0.5x\left(n-1\right)$$

1. find the impulse response sequence$ y\left(n\right)$ due to the impulse sequence$ δ\left(n\right)$.
2. find the output response of the system when the unit step function$ u\left(n\right)$ is applied.