CEN352 Home work

Name: ***ID:***

Exercise1

Consider three analog signals sampled at the same rate of 8000 Hz given by:

$$x_1(t) = 6\cos(4000\pi t) + 3\cos(6000\pi t) \quad for\ t \geq 0$$

$$x_2(t) = 6\cos(4000\pi t) + 3\cos(8000\pi t) \quad for\ t \geq 0$$

$$x_3(t) = 6\cos(10000\pi t) + 3\cos(15000\pi t) \quad for\ t \geq 0$$

1. Plot these signals in time domain using MATLAB.
2. Sketch the spectrum of these three original signals.
3. Sketch the spectrum of sampled signals up to 20 KHz.
4. Sketch the recoverd analog signals spectgrum if an ideal lowpass filter with cuatoff frequency of 4 kHz is used to filter the above sampled signals in order to recover the original signals.

Exercise2

Consider the difference equation with an initial condition $x(-2) = \mathrm{x}(-1) = 0$.

$$y(n) = 0.75x(n) + 0.5x(n-1) - 0.25x(n-2)$$

1. Determine the unit-impulse response $h(n)$.

2. Draw the system block diagram.

3. Write the output using the obtained impulse response.

Exercise 3

Given a sequence $\boldsymbol{x(n)}$for $0 \leq n \leq 3$, where $\mathbf{x(0) = 0.8}$, $\mathbf{x(1) = 0.6}$, $\mathbf{x(2) = 0.4}$, and $\mathbf{x(3) = 0.2}$, assuming fs = 100 Hz,

a. evaluate its DFT $\mathbf{X(k)}$.
b. compute the amplitude spectrum, phase spectrum, and power spectrum.
c. evaluate its inverse DFT $\boldsymbol{x(n)}$.

Exercise 4

Using the partial fraction expansion method, find the inverse of the following z-transforms:

a. $X(z) = \dfrac{1}{z^2 - 0.3z - 0.24}$

b. $X(z) = \dfrac{z}{(z-0.2)(z+0.4)}$

c. $X(z) = \dfrac{z}{(z+0.2)(z^2 - z + 0.5)}$

d. $X(z) = \dfrac{z(z+0.5)}{(z-0.1)^2(z-0.6)}$