ICE503 DSP-Homework#1

1. Consider a discrete-time system which can develop the output sequence:

$$y[n] = 3x[n] + 4x[n-1] - x[n-2] + 2x[n-4]$$

(a) Plot the block diagram for this system.

(b) The input sequence $x[n]$ is shown in Figure 1, sketch and label $y[n]$.

(c) Following (b), sketch and label the down sampling sequence $y[3n]$.

(d) Following (b), sketch and label the up sampling sequence $y[\frac{1}{2}n]$.

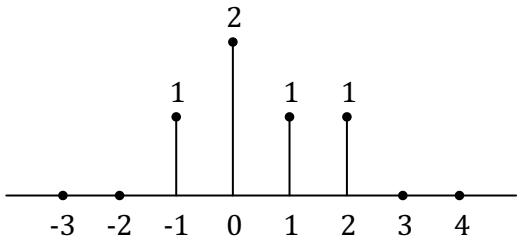

Figure 1: The input sequence $x[n]$

2. Determine whether each of the following signals is periodic. If the signal is periodic, state its fundamental period.

(a) $x[n] = 6\cos\left(\frac{\pi}{2}n\right)$

(b) $x[n] = n\sin\left(\frac{\pi}{12}n\right)$

(c) $x[n] = e^{j\frac{3}{4}\pi n}$

3. MATLAB simulation:

(a) Generate the complex-valued signal.

$$x[n] = e^{j\frac{1}{10}\pi n}, \qquad n = -10, \dots, -1, 0, 1, \dots 10$$

(b) Use `stem` function to plot the real part and the imaginary part of $x[n]$.

(c) Determine whether $x[n]$ is a conjugate symmetric sequence or a conjugate antisymmetric sequence, and explain the reason.