# DSP Assignment 1

Shanu Kumar

150659

**Solution 1(a)**

Since $d_n$ has to be equal to $c_n$, we have the following relation

$$(b_n + jc_n)e^{(-j\theta_n)} = a_n$$

Equating real and imaginary parts

$$b_n cos(\theta_n) + c_n sin(\theta_n) = a_n$$

$$b_n sin(\theta_n) = c_n cos(\theta_n)$$

$$\implies c_n = b_n tan(\theta_n)$$

Substituting $c_n$ in the above equation we get,

$$b_n sin^2(\theta_n) + b_n cos^2(\theta_n) = a_n cos(\theta_n)$$

$$\implies b_n/a_n = cos(\theta_n) = cos(n\pi/2)$$

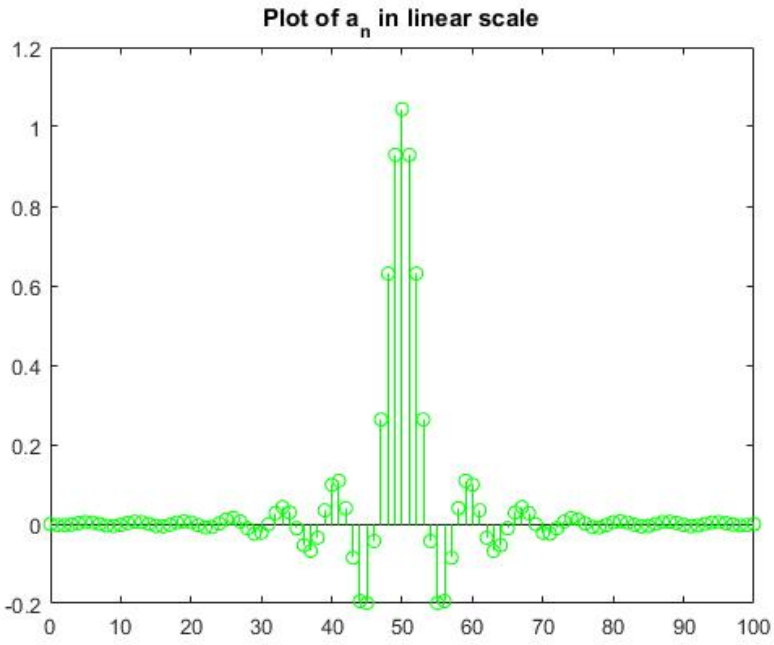
$$\implies \theta_n = 2m\pi + n\pi/2, m \in I$$

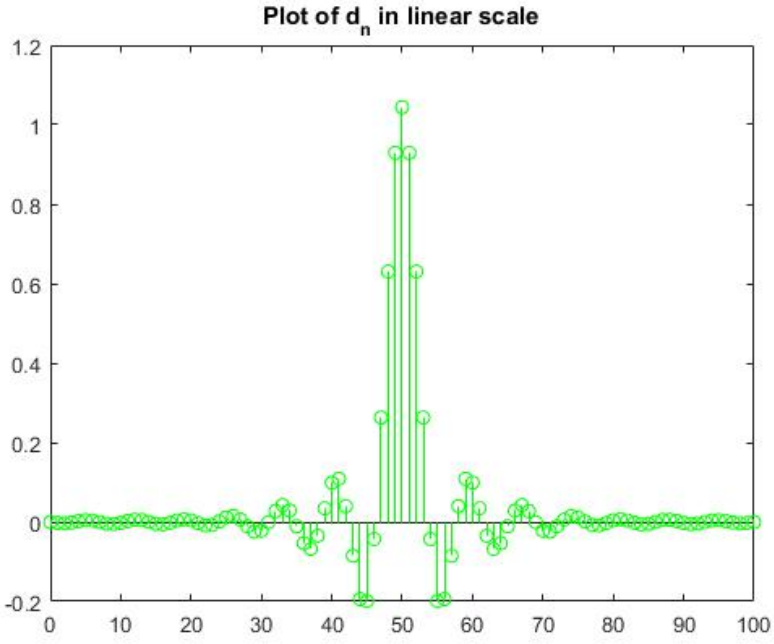
Choosing $\theta_n = n\pi/2$

As the output of the Hilbert transform is symmetric about a = 150 and the output $c_n$ has 100 values, we should take values symmetric about n = 150,that is, n will be from 100 to 200

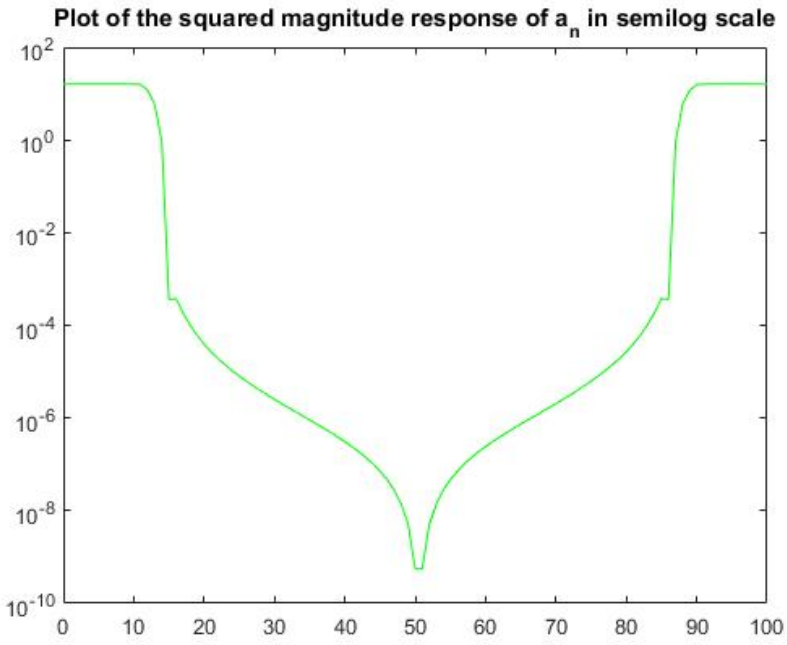
Therefore required value of $n_1 = 100$

**Solution 1(b)**


Plot of a_n in linear scale
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
40
50
60
70
80
90
100


Plot of d_n in linear scale
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
40
50
60
70
80
90
100

**Solution 1(c)**




**Solution 1(d)**