Circular and Linear Convolution

1. Generate and plot a random signal \( x[n] \) of length \( N = 1024 \) having uniform distribution \([0:10]\).

2. Generate and plot a hamming window signal \( h[n] \) of length \( M = 256 \), where

\[
h[n] = \begin{cases} 
0.54 - 0.46 \cos(2\pi n / M) & 0 \leq n \leq M \\
0 & \text{otherwise}
\end{cases}
\]

3. Write a function to implement a linear convolution of \( x[n] \) with \( h[n] \). Plot your results.

4. Obtain and plot the N-point Fourier Transform \( X[k] \) and \( H[k] \), \( N = 1024 \).

5. Calculate and plot \( Y[k] = X[k] H[k] \) and its inverse \( y[n] \). Compare your results with the ones obtain in step 3.

6. Modify step 4 and 5 to obtain the linear convolution using the Fourier transform.

7. Repeat steps 2 to 6 using

\[
h[n] = \begin{cases} 
0.42 - 0.5 \cos(2\pi n / M) + 0.08 \cos(4\pi n / M) & 0 \leq n \leq M \\
0 & \text{otherwise}
\end{cases}
\]