EXPERIMENT 6 – PROPERTIES OF DFT:

CODE:

# -\*- coding: utf-8 -\*-

"""

Created on Tue Feb 27 10:50:39 2024

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"""

import numpy as np ,matplotlib.pyplot as plt

from scipy.fft import fft

plt.figure(1)

plt.suptitle("Input and Impulse signal")

t3=np.arange(-1,2)

h1=[2,-4,2]

t4=np.arange(0,6)

x1=[3,-6,9,-12,15,-18]

g=len(x1)

h=len(h1)

if g!=h:

count=g+h-1

x1=np.pad(x1,(0,count-g))

h1=np.pad(h1,(0,count-h))

plt.subplot(1,2,2)

plt.title("h[n]")

plt.xlabel("n")

plt.ylabel("Ampitude")

t1=np.arange(-1,7)

plt.stem(t1,h1)

plt.subplot(1,2,1)

plt.title("x[n]")

plt.xlabel("n")

plt.ylabel("Ampitude")

t2=np.arange(0,8)

plt.stem(t2,x1)

def circ\_conv(x1,x2):

N=len(x1)

y=np.zeros\_like(x1,complex)

for i in range(N):

for k in range(N):

if(i-k)>=0:

y[i]+=x1[k]\*x2[i-k]

else:

y[i]+=x1[k]\*x2[N-k+i]

return y.real

s=circ\_conv(x1,h1)

plt.figure(2)

plt.subplot(1,2,1)

plt.title("y[n] with circular convolution function")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,7),s)

s2=np.convolve(x1,h1)

plt.subplot(1,2,2)

plt.title("y[n] with built in convolution function")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,14),s2)

def dft(x):

N1=len(x)

c=[sum(x[n]\*np.exp(-2j\*np.pi\*k\*n/N1)for n in range(N1)) for k in range(N1)]

return np.array(c)

def idft(x):

N1=len(x)

c2=[sum(x[k]\*np.exp(2j\*np.pi\*k\*n/N1)for k in range(N1))/N1 for n in range(N1)]

return np.array(c2)

plt.figure(3)

a=dft(x1)

plt.subplot(2,2,1)

plt.title("DFT of x[n] with loop function")

plt.xlabel("k")

plt.ylabel("Ampitude")

plt.stem(a)

b=dft(h1)

plt.subplot(2,2,2)

plt.title("DFT of h[n] with loop function")

plt.xlabel("k")

plt.ylabel("Ampitude")

plt.stem(b)

a1=fft(x1)

plt.subplot(2,2,3)

plt.title("DFT of x[n] with built in function")

plt.xlabel("k")

plt.ylabel("Ampitude")

plt.stem(a1)

b1=fft(h1)

plt.subplot(2,2,4)

plt.title("DFT of h[n] with built in function")

plt.xlabel("k")

plt.ylabel("Ampitude")

plt.stem(b1)

plt.figure(4)

c=a\*b

plt.subplot(1,2,1)

plt.title("X[k]\*H[k]")

plt.xlabel("k")

plt.ylabel("Ampitude")

plt.stem(c)

d=idft(c)

plt.subplot(1,2,2)

plt.title("IDFT of X[k]\*H[k]")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,7),d)

plt.figure(5)

plt.subplot(1,3,1)

plt.title("y[n] with circular convolution function")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,7),s)

plt.subplot(1,3,2)

plt.title("y[n] with built in convolution function")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,14),s2)

plt.subplot(1,3,3)

plt.title("IDFT of X[k]\*H[k]")

plt.xlabel("n")

plt.ylabel("Ampitude")

plt.stem(np.arange(-1,7),d)

OUTPUT:





