EXPERIMENT 5 – COMPUTATION OF DFT:

CODE:

import numpy as np ,matplotlib.pyplot as plt

from scipy.fft import fft,ifft

fs=450

tstep=1/fs

fo=30

N=int(fs/fo)

t=np.linspace(0,(N-1)\*tstep,N)

fstep=fs/N

f=np.linspace(0,(N-1)\*fstep,N)

x=20\*np.cos(2\*np.pi\*fo\*t + (np.pi))

plt.figure(1) ##generating the input sinusoid

plt.stem(t,x)

plt.xlabel("Time")

plt.ylabel("Amplitude")

plt.title("S2[n]")

plt.suptitle("Input Signal\n\nAmplitude = 10 Frequency = 15Hz Phase Shift = 180 degrees")

plt.figure(2) ##computing user defined dft

plt.suptitle("Forward DFT")

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

plt.subplot(221) #plotting the magnitude spectrum

plt.stem(f,np.abs(c))

plt.xlabel("k")

plt.ylabel("Amplitude")

plt.title("DFT from User's Program (Magnitude)")

plt.subplot(222) #plotting the phase spectrum

plt.plot(np.angle(c))

plt.xlabel("k")

plt.ylabel("Angle")

plt.title("DFT from User's Program (Angle)")

c1=fft(x) #computing dft in user defined function

plt.subplot(223) #plotting the magnitude spectrum

plt.stem(f,np.abs(c1))

plt.xlabel("k")

plt.ylabel("Amplitude")

plt.title("DFT from Built-in Function (Magnitude)")

plt.subplot(224) #plotting the phase spectrum

plt.plot(np.angle(c1))

plt.xlabel("k")

plt.ylabel("Angle")

plt.title("DFT from Built-in Function (Angle)")

plt.figure(3) ##computing user defined inverse dft

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

plt.subplot(221) #plotting the magnitude spectrum

plt.stem(t,np.real(y))

plt.xlabel("Time")

plt.ylabel("Amplitude")

plt.title("IDFT from User's Program (Magnitude)")

plt.subplot(222) #plotting the phase spectrum

plt.plot(np.angle(y))

plt.xlabel("k")

plt.ylabel("Angle")

plt.title("IDFT from User's Program (Angle)")

print(y) #printing the complex list comtaining the signal

y1=ifft(c) #computing inverse dft in user defined function

plt.subplot(223) #plotting the magnitude spectrum

plt.stem(t,np.real(y1))

plt.xlabel("Time")

plt.ylabel("Amplitude")

plt.title("IDFT from Built-in Function (Magnitude)")

print(y1)

plt.subplot(224) #plotting the phase spectrum

plt.plot(np.angle(y1))

plt.xlabel("k")

plt.ylabel("Angle")

plt.title("IDFT from Built-in Function (Angle)")

OUTPUT:



