

EENG/INFE 226 SIGNALS AND SYSTEMS
LAB 6
FOURIER SERIES and FOURIER TRANSFORM REPRESENTATION

Answer:

```

N=24;
n=0:N-1;
x=ones(1,length(n))+sin(n*pi/12+
3*pi/8);
X=(1/N)*fft(x);
x1=N*ifft(X);

figure(1)

stem(n,x,'filled')
xlabel('time')
ylabel('Amplitude')
title('x[n]')

figure(2)

subplot(2,1,1),stem(n,real(X),'f
illed')
xlabel('k')
ylabel('FS Real Part')
title('real part of X[k]')

subplot(2,1,2),stem(n,imag(X),'f
illed')
xlabel('k')
ylabel('FS Imaginary part')
title('imaginary part of X[k]')

figure(3)

subplot(2,1,1),stem(n,abs(X),'fi
lled')
xlabel('k')
ylabel('amplitude')
title('Magnitude of X[k]')

subplot(2,1,2),stem(n,angle(X),'
filled')
xlabel('k')
ylabel('amplitude')
title('Angle of X[k]')

figure(4)

subplot(2,1,1),stem(n,real(x1),'
filled')
xlabel('time')
ylabel('Amplitude')
title('real part of x1[n]')

subplot(2,1,2),stem(n,imag(x1),'f
illed')
xlabel('time')
ylabel('Amplitude')
title('imaginary part of x1[n]')

```

Figure 1

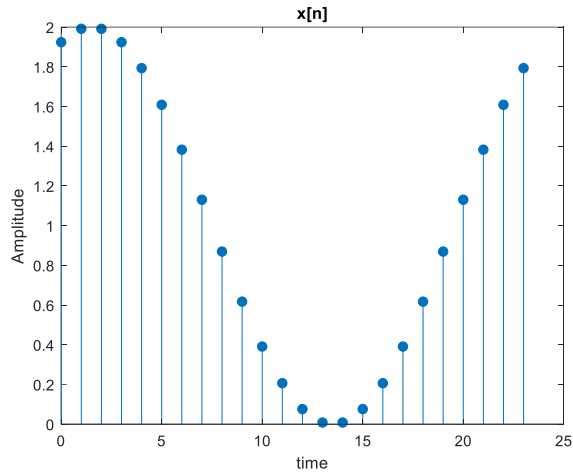


Figure 3

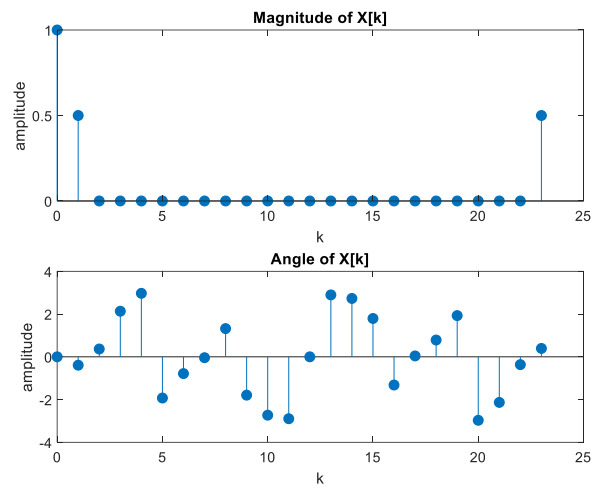


Figure 2

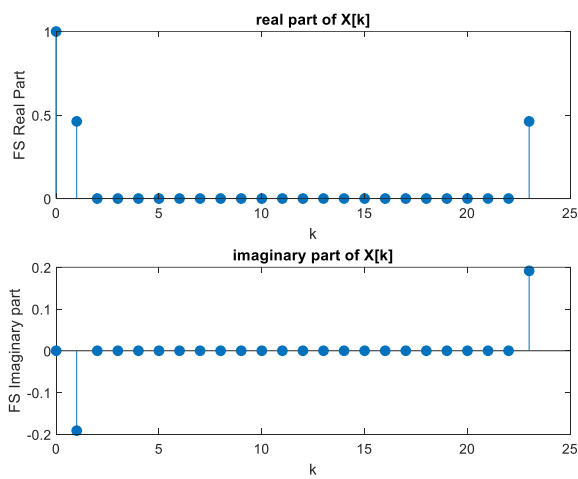
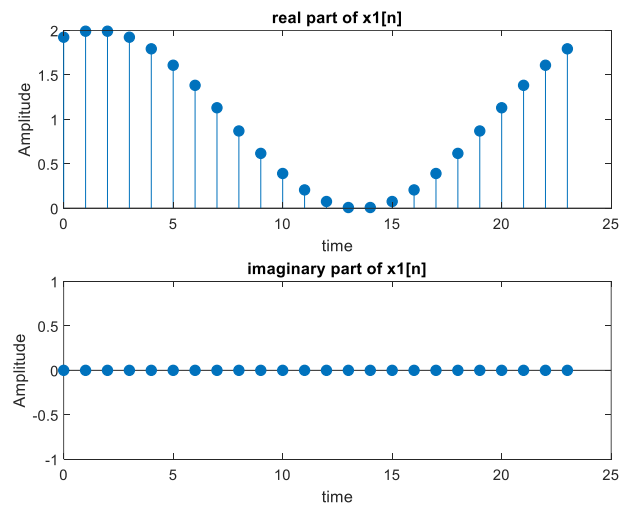


Figure 4



6.3 freqz

Answer:

```
a=[1 -0.75 0.6];
b=[2 -1];
[H1 omega1]=freqz(b,a,4)
```

(a) Use *freqz* with the coefficients from Part (a) to define H1 to be the value of the frequency response at 4 evenly spaced frequencies between 0 and 2π and *omega1* to be those frequencies.

Answer:

```
H1 =
    5.0000
    2.8200 - 1.3705i
    1.8293 - 1.4634i
    0.9258 - 0.9732i

omega1 =
    0
    0.7854
    1.5708
    2.3562
```

(b) Use *freqz* to define H2 to be the value of the frequency response at 4 evenly spaced frequencies between 0 and 2π and *omega2* to be those frequencies. The following sample output shows the values each vector should have if you have defined things correctly

Answer:

```
[H2 omega2]=freqz(b,a,4,'whole')
H2 =

    1.1765 + 0.0000i
    2.1453 - 1.5225i
    1.2766 + 0.0000i
    2.1453 + 1.5225i
```

```
omega2 =
    0
    1.5708
    3.1416
    4.7124
```