	ELECTRICAL ENGINEERING DEPARTMENT (EEC 271) SIGNALS&SYSTEMS SPRING 2022 - 2023

LAB(2) REPORT

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Section:	4

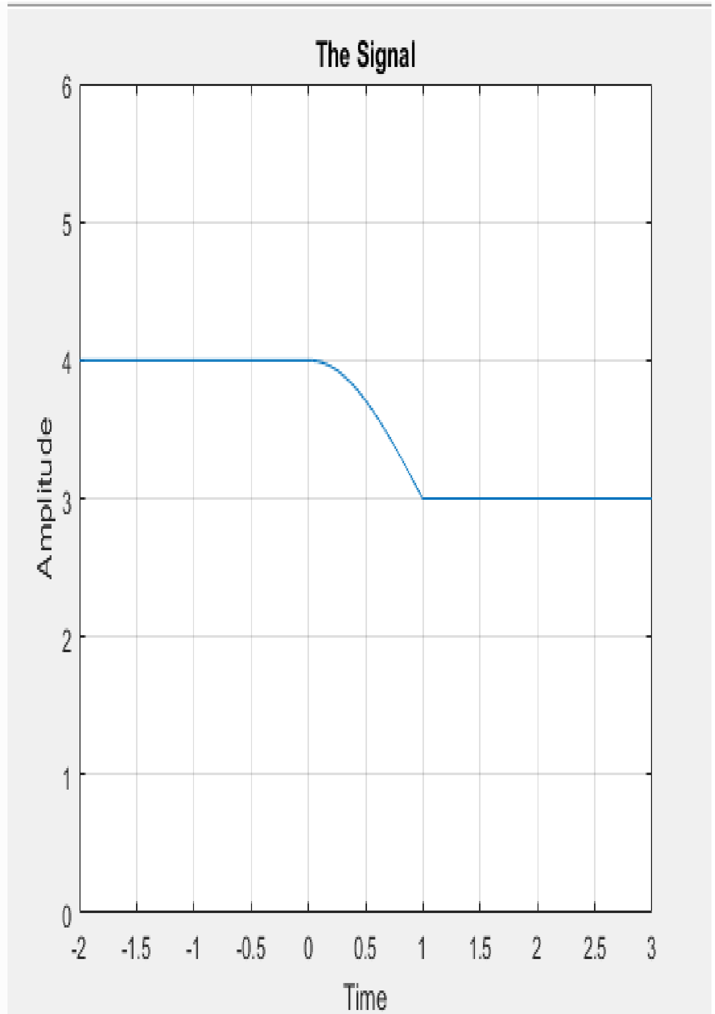
Department:	Electronics and Communication

Task 1

Code

```
clear all;
clc;
DcSignal_1 = 4 * ones( 1 , ( 2 - 0 ) * 100 );
t = linspace( 0 , 1 , 100 );
Sinusoidal_signal = cos( 2 * pi * ( t * 0.25 ) )+3;
DcSignal_2 = 3 * ones( 1 , ( 3 - 1) * 100 );
time = linspace( -2 , 3 , ( 3--2 ) * 100 );
Main_Signal = [ DcSignal_1 Sinusoidal_signal DcSignal_2 ];
figure
plot( time , Main_Signal );
axis( [ -2 3 0  6 ] );
title('The Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
```

Result

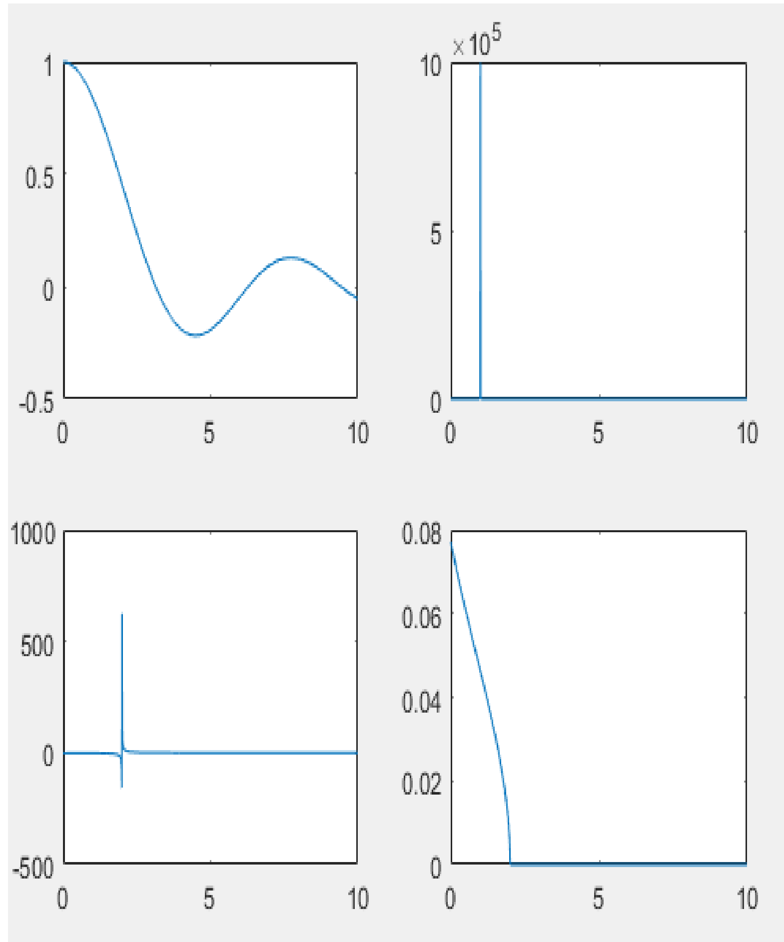


Task2

Code

```
clear all;
clc;
x = linspace( 0 , 10 , 1000 );
Y1 = sin( x ) ./ x;
Y2 = ( 1 ./ ( x - 1 ).^2 ) + x ;
Y3 = ( x.^2 + 1  ) ./ ( x.^2 - 4 ) ;
Y4 = ( 10 - x ).^(1/3) ./ (  4 - x.^2  ).^(1/2) ;
subplot(2,2,1)
plot(x,Y1)
subplot(2,2,2)
plot(x,Y2)
subplot(2,2,3)
plot(x,Y3)
subplot(2,2,4)
plot(x,Y4)
```

Result

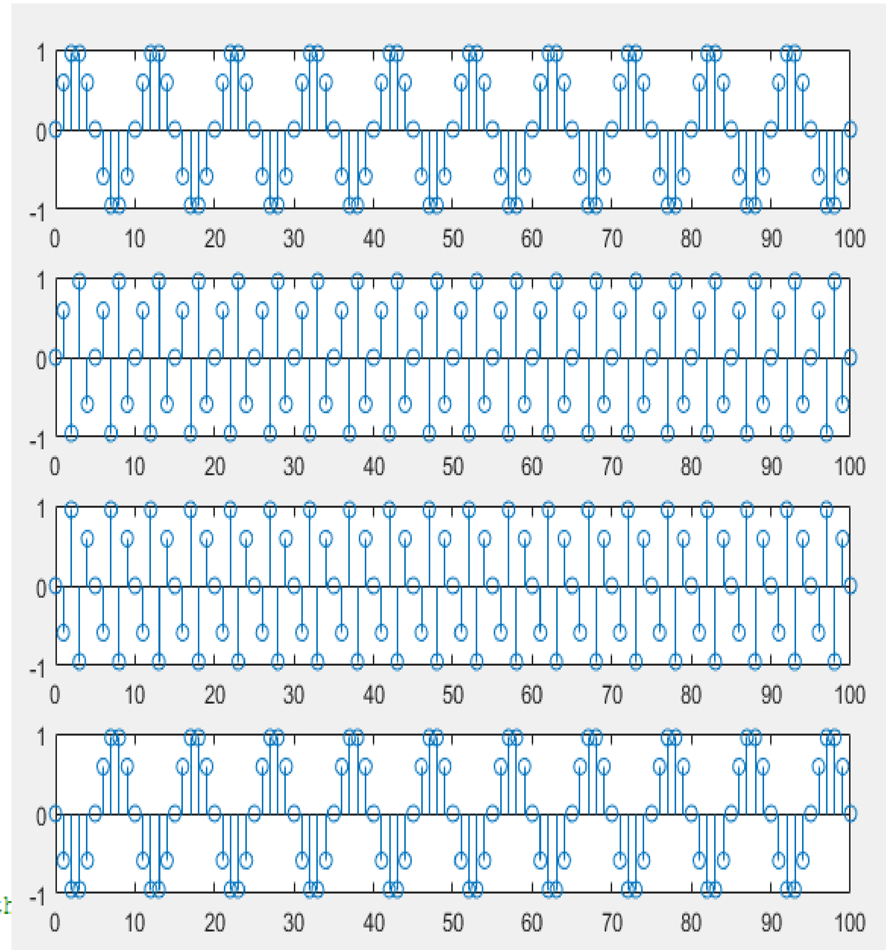


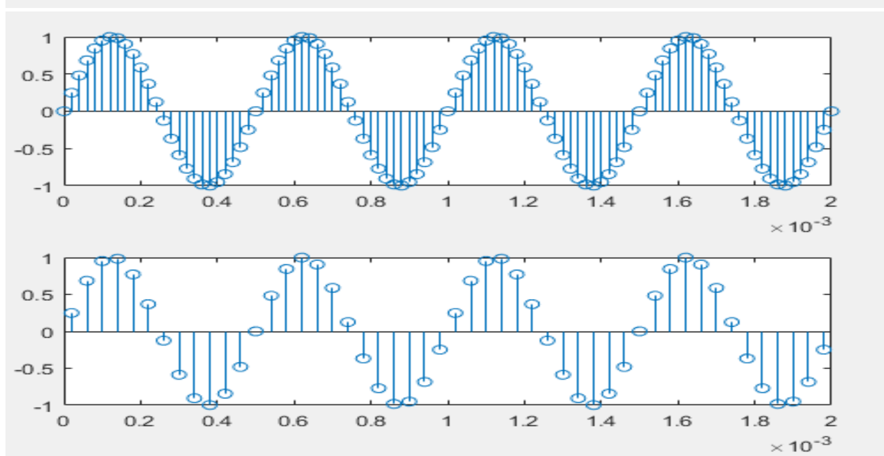
Task3

Code

```
clc
n=0:100;
%defining number of samples 100 sample.
t=n./5000;
%no of samples(n) = time(t) / samplinf frequency(500)
x1=sin(2*pi*500*t);
x2=sin(2*pi*2000*t);
x3=sin(2*pi*3000*t);
x4=sin(2*pi*4500*t);
%4functions for the 4 different values of f0
%plotting the signals using stem function
subplot(4,1,1);
stem(n,x1);
subplot(4,1,2);
stem(n,x2);
subplot(4,1,3);
stem(n,x3);
subplot(4,1,4);
stem(n,x4);
% when fs=50000anf f0=2000
t_new=n./50000;
%definning a new time
t_new_even=t_new(2:2:100);
%to select only even samples we take step of 2 from th
x_new=sin(2*pi*2000*t_new);
x_new_even=x_new(2:2:100);
%plottinf the new fun tions
figure;
subplot(2,1,1);
stem(t_new,x_new);
subplot(2,1,2);
stem(t_new_even,x_new_even);
```

Result





First comment

Similarities	Differences
They have the same amplitude.	Different number of samples.
They are all periodic .number.	Different accuracy due to samples

Second comment

1-frequency of x(n)= 1/25 =0.04

2-y(n) is periodic with frequency =2/25 =0.08

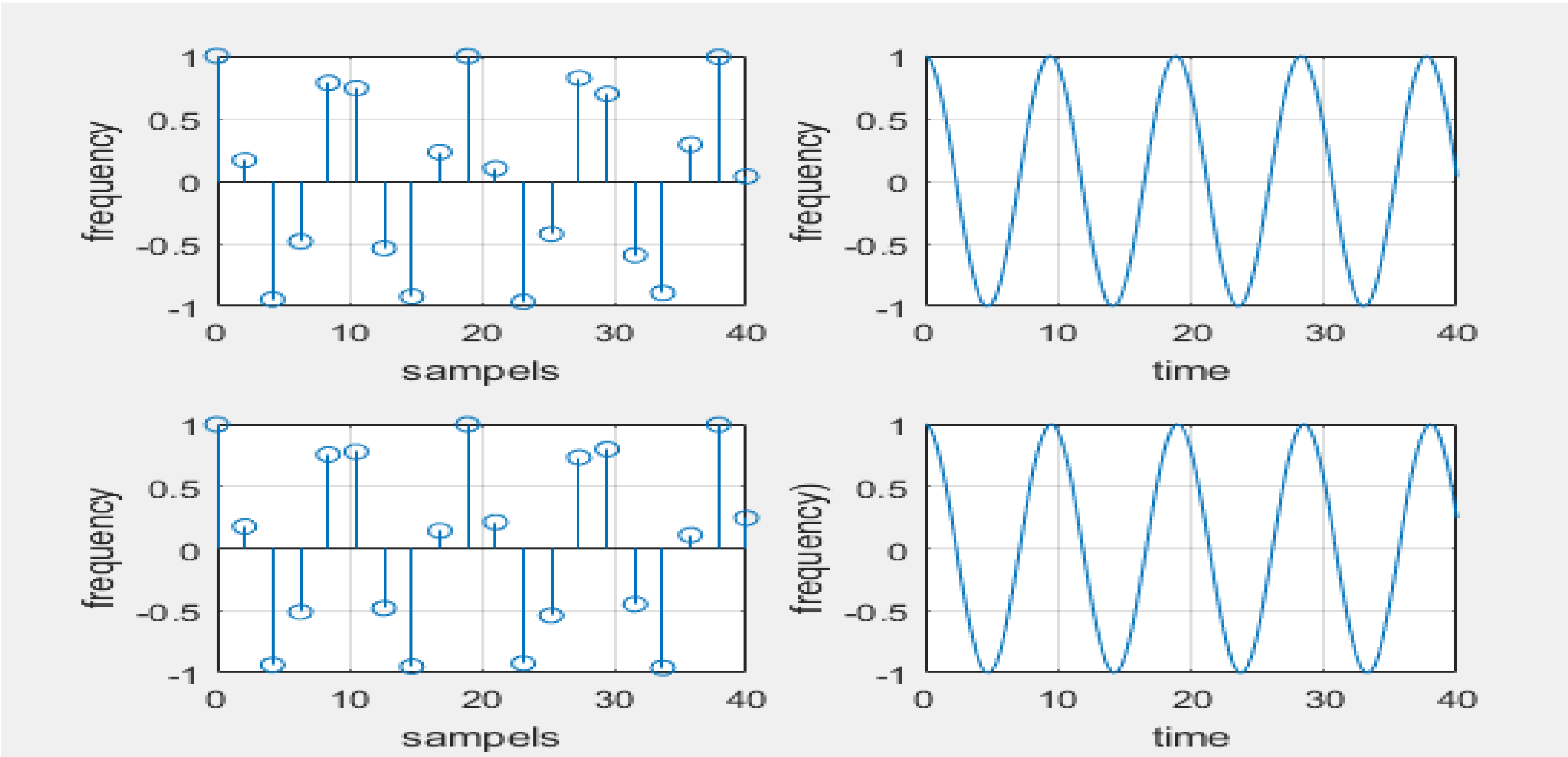
Task4

Code

```
clear
n=linspace(0,40,20);
t=linspace(0,40,4000);
%----------------------------------;
Xdis=cos((2.*n)./3);%disrete signal
Xcont=cos((2.*t)./3);%contineous signal
%--------------------------------------;
Ydis=cos((8.*pi.*n)./38)%disrete signal
Ycont=cos((8.*pi.*t)./38)%contineous signal
%----------------------------------------;
subplot(2,2,1)
stem(n,Xdis)
xlabel('sampels');
ylabel('frequency');
grid on;
```

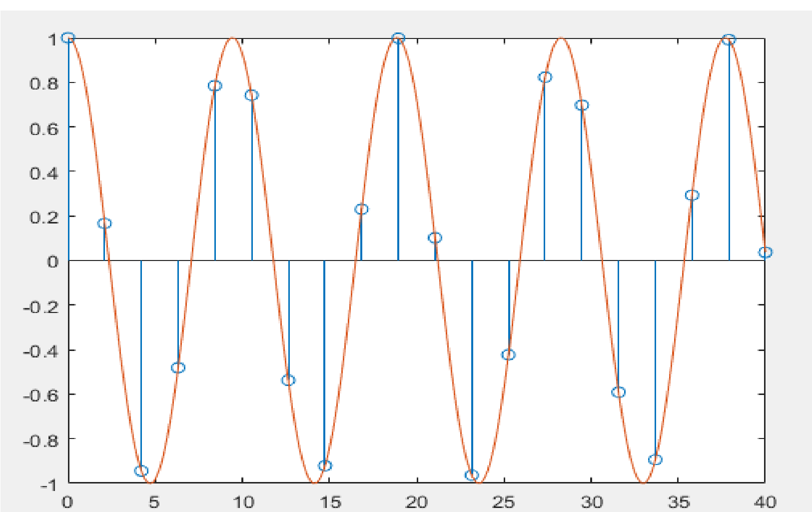
```
subplot(2,2,3);
stem(n,Ydis);
xlabel('sampels');
ylabel('frequency');
grid on;
subplot(2,2,4);
plot(t,Ycont);
xlabel('time');
ylabel('frequency)');
grid on;
%for better vesion of the functions
figure;
stem(n,Xdis,'k-o');
figure;
stem(n,Ydis,'k-o');
figure;
plot(t,Xcont);
```

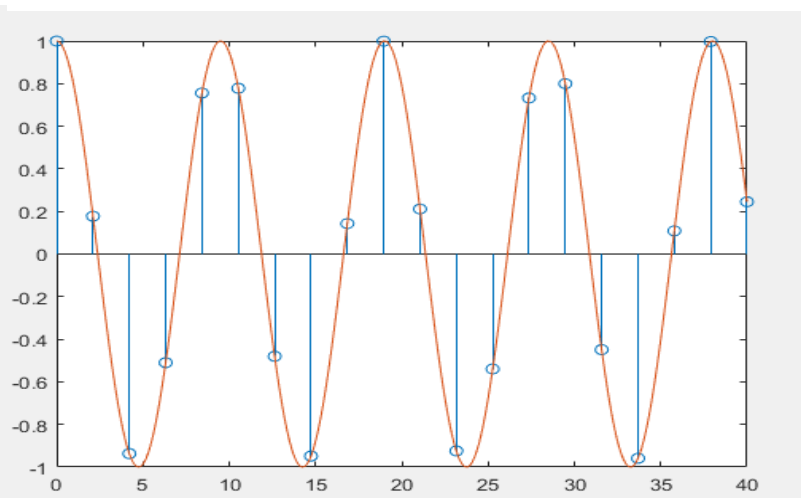
Result



Comment:

- The sequences are **PERIODIC**
- In one period for the continuous signals it
- Makes 1cycle every 10 seconds





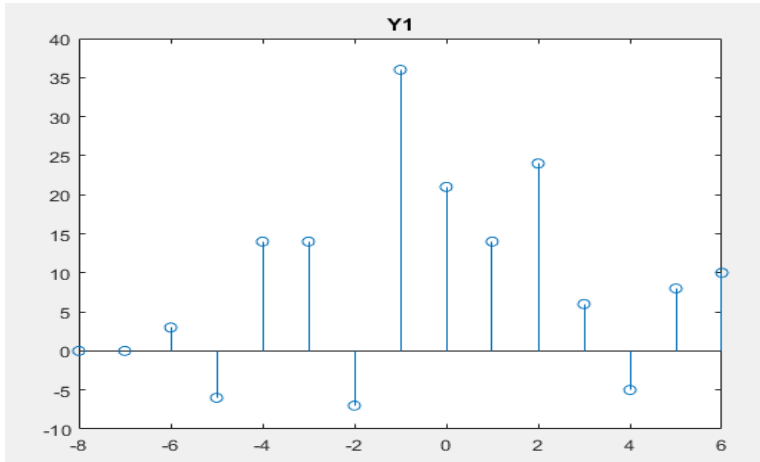
Task5

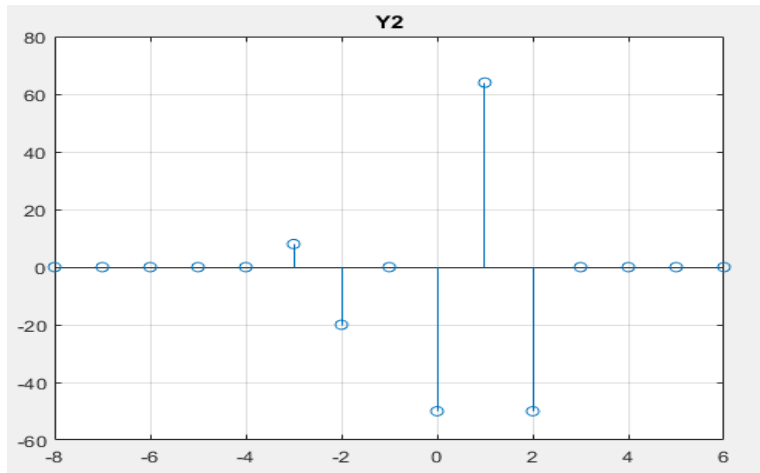
Code

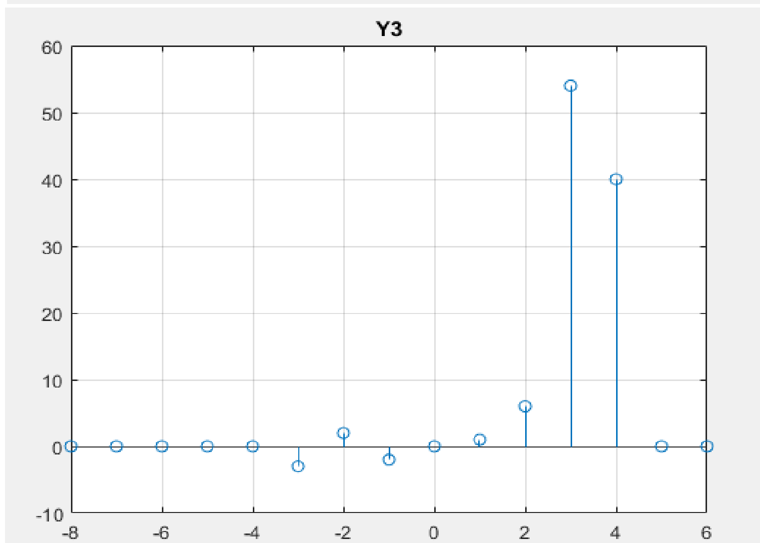
```
clc
x=[0,0,0,0,1,-2,4,6,-5,8,10,0,0,0,0];  %define the sequence
n=linspace(-8,6,15);
%----------------------------;
%defining the terms of the first magnitude.
x11=3*[ x(3:end) zeros(1,2)]; %3x(n+2)
x12=[zeros(1,4) x(1:end-4)];  %x(n-4)
x13=2*x;                      %2x
figure;
y1=x11+x12+x13;               %3x(n+2)+x(n-4)+2x
stem(n,y1);
title('Y1');
%-----------------------------;
%defining the terms of the second magnitude.
x21=[x(5:end) zeros(1,4)];      %x(n+4)
x22= [zeros(1,1) x(1:end-1)];   %x(n-1)
xtemp= [x(3:end) zeros(1,2)];
x23= [ zeros(1,2) xtemp(end:-1:3)]; %x(2-n)
y2=(x21.*x22)+(x23.*x);

figure;
stem(n,y2);
grid on;
title('Y2');
%-----------------------------;
figure;
y3=n.*[zeros(1,1) x(1:end-1)] + n.*[zeros(1,2) x(1:end-2)]
+ n.*[zeros(1,3) x(1:end-3)] + n.*[zeros(1,4) x(1:end-4)]
+n.*[zeros(1,5) x(1:end-5)];
stem(n,y3);
grid on;
title('Y3');
```

Result







Task6

Code

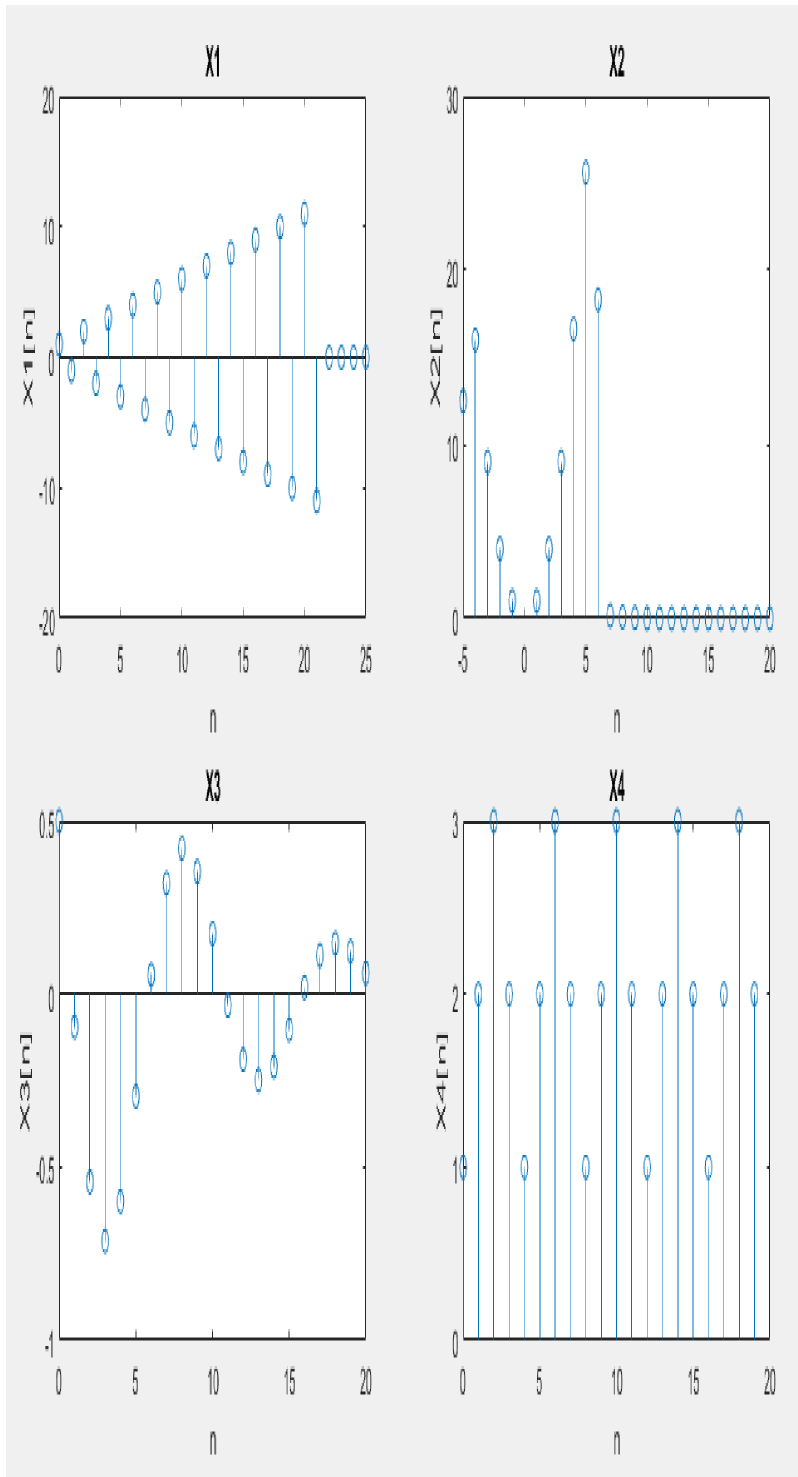
```
%Clear Command window
clear all;
clc;
%a)
n1 = 0 : 25;
X1= zeros( size( n1 ) );
for m = 0 : 10
    X1 = X1 + ( ( m+1 ) * ( dirac( n1 - 2 * m ) - dirac( n1 - 2 * m - 1  ) ) ) ;
    X1( X1 == Inf ) = m + 1 ;
    X1( X1 == -Inf ) = -( m + 1 ) ;
end

%b)
n2 = -5 : 20 ;
X2 = (n2.^2) .*( heaviside( n2 + 5 ) - heaviside( n2 - 6 ) ) + 10 * dirac( n2 ) +  20 .* 0.5.^( n2

%c)
n3 = 0 : 20 ;
X3 = ( (0.9).^n3 ) .* cos( 0.2 * pi * n3 + pi / 3 );

%d)
n4 = 0 : 19 ;
period_of_X4 = [1, 2, 3, 2];
X4 = repmat(period_of_X4, 1, 5);
%a)
subplot(2,2,1);
stem(n1, X1);
xlabel('n');
ylabel('X1[n]');
title('X1');
%b)
subplot(2,2,2);
stem(n2, X2);
xlabel('n');
ylabel('X2[n]');
title('X2');
%c)
subplot(2,2,3);
stem(n3, X3);
xlabel('n');
ylabel('X3[n]');
title('X3');
%d)
subplot(2,2,4);
stem(n4, X4);
xlabel('n');
ylabel('X4[n]');
title('X4');
```

Result



TASK7

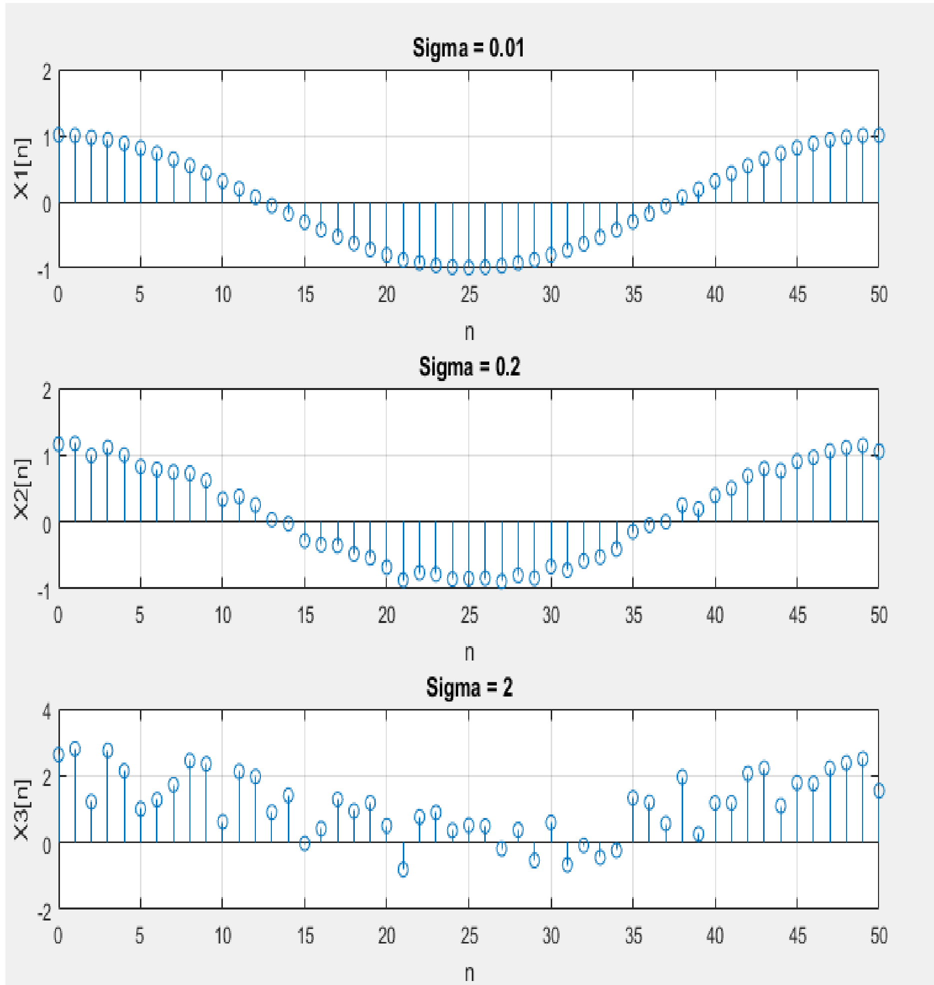
CODE

```
Clear Command window
clear all;
clc;
%Generating n which from 0 to 50 by step 1
n = 0 : 50 ;
W = rand( 1 , 51 ) ;
%At sigma = 0.01
sigma = 0.01 ;
X1 = cos( 0.04 * pi * n ) + sigma * W ;
%At sigma = 0.2
sigma = 0.2 ;
X2 = cos( 0.04 * pi * n ) + sigma * W ;
%At sigma = 2
sigma = 2 ;
X3 = cos( 0.04 * pi * n ) + sigma * W ;
%Ploting the graphs

subplot( 3 , 1 , 1 )
stem(n,X1)
title('Sigma = 0.01');
xlabel('n');
ylabel('X1[n]');
grid on;
 subplot( 3 , 1 , 2 )
 stem(n,X2)
 title('Sigma = 0.2');
 xlabel('n');
 ylabel('X2[n]');
 grid on;

 subplot( 3 , 1 , 3 )
 stem(n,X3)
 title('Sigma = 2');
 xlabel('n');
 ylabel('X3[n]');
 grid on;
```

RESULT



comment

Here w[n] represent a noise is introduced to our main signal which is the cosine function We use randn command to generate an array of random numbers to represent our noise and at every trail these random numbers are changed. we multiply this array by a sigma , first when sigma was a small value ($\sigma = 0.01$) the noise was having little effect on the main function as in the first graph when sigma increased ($\sigma = 0.2$) the effect of distorting the signal starts to appear as in the second graph, but the signal is not totally changed as in case three when sigma is greater than 1 ($\sigma = 2$) in this case our original signal is totally affected and changed by the noise as in the third graph.

Task8

Code

```
n=-10:1:10;
signal=exp(n.*(-0.1+0.3i));
%-------------------;
%function real returns the real part of
Real_part=real(signal);
subplot(2,2,1)
stem(n,Real_part);
grid on;
ylabel('Real');
xlabel('samples');
title('Real');
%-------------------;
%function imaginary returns the imaginar
Imaginary_part=imag(signal);
subplot(2,2,2)
stem(n,Imaginary_part);
grid on;
ylabel('Imaginary');
xlabel('samples');
title('Imaginary');
%-----------------;
%function abs returns the magnitude of the signal
Magnitude=abs(signal);
subplot(2,2,3)
stem(n,Magnitude);
grid on;
ylabel('Magnitude');
xlabel('samples');
title('Magnitude');
%------------------;
%function anglereturns the angle of the signal
Angle=angle(signal);
subplot(2,2,4)
stem(n,Angle);
grid on;
ylabel('Angle');
xlabel('samples');
title('angle');
```

Result