

# LAB ASSIGNMENT NO: 1

## Program 1

```
>> a=2;  
b=3;  
c=a+b
```

```
c =
```

```
5
```

## Program 2

```
>> c=a*b
```

```
c =
```

```
6
```

## Program 3

```
>> c=a/b
```

```
c =
```

```
0.6667
```

## Program 4

```
>> c=a^2
```

```
c =
```

```
4
```

### **Program 5**

```
>> y=2*(1+4*j);  
>> abs(y)
```

```
ans =
```

```
8.2462
```

### **Program 6**

```
>> angle(y)
```

```
ans =
```

```
1.3258
```

### **Program 7**

```
>> a=[1 2 3]
```

```
a =
```

```
1 2 3
```

```
>> b=[3 4 5]
```

```
b =
```

```
3 4 5
```

```
>> c=a+b
```

```
c =
```

```
4 6 8
```

### **Program 8**

```
>> a=[1 2 3;4 5 6;7 8 9]
```

```
a =
```

```
1 2 3
4 5 6
7 8 9
```

```
>> b=[4 5 6;7 8 9;1 2 3]
```

```
b =
```

```
4 5 6
7 8 9
1 2 3
```

```
>> d=a*b
```

```
d =
```

```
21 27 33
57 72 87
93 117 141
```

## Program 9

```
>> x=zeros(2,3)
```

```
x =
```

```
0 0 0
0 0 0
```

## Program 10

```
>> y=ones(3,3)
```

```
y =
```

```
1 1 1
1 1 1
1 1 1
```

### Program 11

```
>> a(3,2)=10
```

```
a =
```

```
1 2 3
4 5 6
7 10 9
```

### Program 12

```
>> a=[1 2 3]
```

```
a =
```

```
1 2 3
```

```
>> b=[2 4]
```

```
b =
```

```
2 4
```

```
>> c=[a b]
```

```
c =
```

```
1 2 3 2 4
```

### Program 13

```
>> y=eye(4)
```

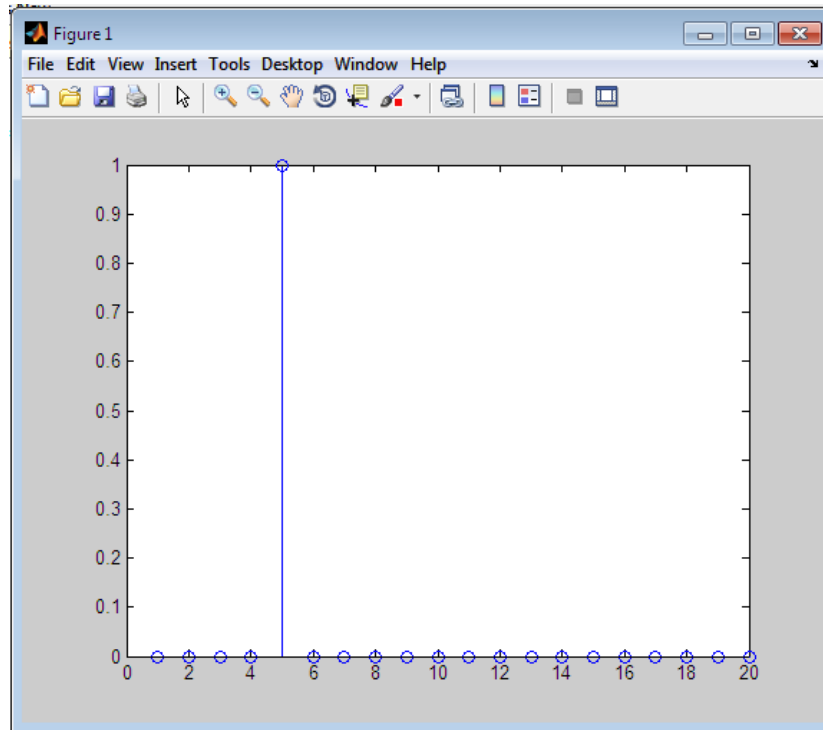
y =

1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

## Unit impulse:

### Program 14

```
clc;
clear all;
a=input('the value of a=');
b=input('the value of b=');
m=input('the magnitude of impulse=');
n=input('the impulse index=');
for i=a:b;
    t(i)=i;
    if i==n
        x(i)=1;
    else
        x(i)=0;
    end
end
x=x*m;
stem(t,x);
```



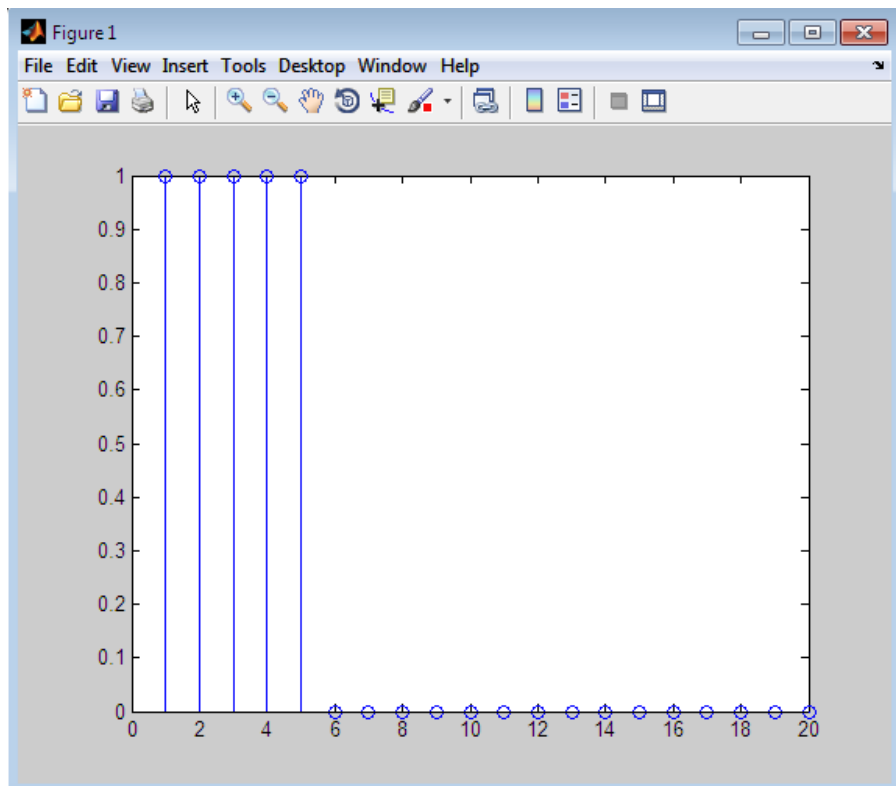
### Program 15

```
clc;
clear all;
a=input('the value of a=');
b=input('the value of b=');
m=input('the magnitude of impulse=');
n=input('the impulse index=');
for i=a:b;
    t(i)=i;
    if i<=n
        x(i)=1;
    else
```

```
x(i)=0;  
end  
end  
x=x*m;  
stem(t,x);
```

## Output

```
the value of a=1  
the value of b=20  
the magnitude of impulse=1  
the impulse index=5  
>>
```



## Sine wave:

### Program 16

```
a=-20
```

```
b=20
```

```
A=2
```

```
w=pi/20
```

```
n=a:b
```

```
x=A*sin(w*n)
```

```
plot(n,x)
```

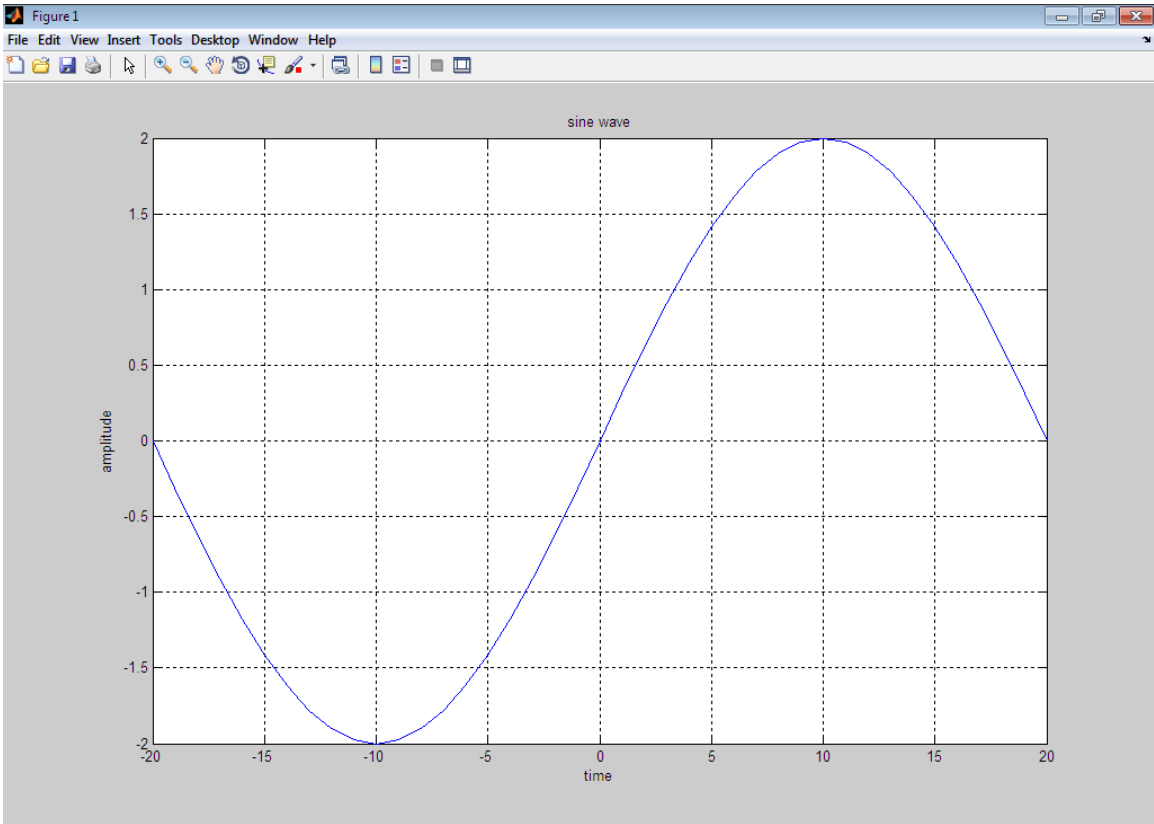
```
xlabel('time')
```

```
ylabel('amplitude')
```

```
title('sine wave');
```

```
grid
```





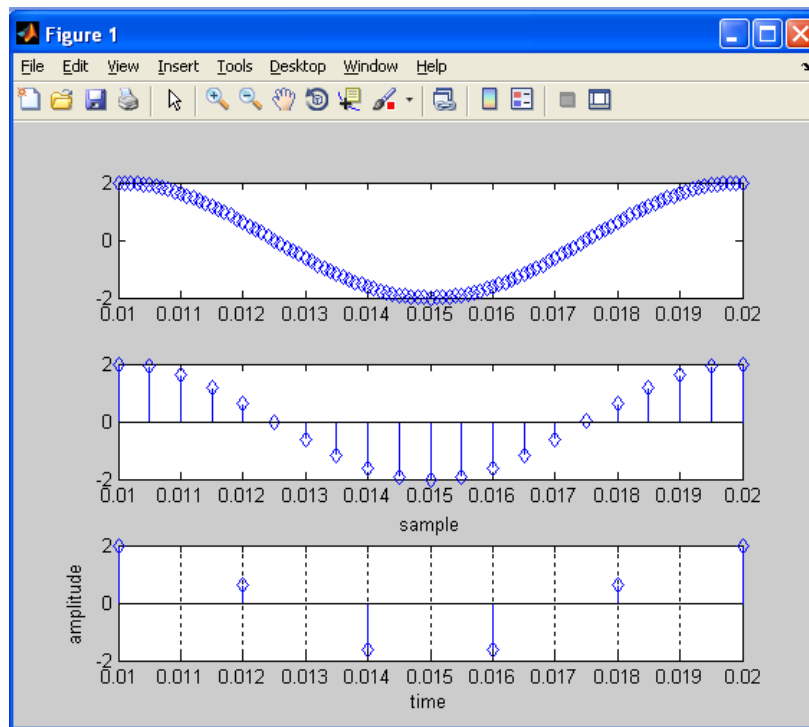
## LAB ASSIGNMENT NO: 2

### Periodic signal and Aperiodic signal:

#### Program 1

```
clear all
f=100;
fs1=2000;
fs2=500;
ts1=1/fs1;
ts2=1/fs2;
d=0;
A=2;
w=2*pi*f;
t1=0.01:0.0001:0.02
t2=0.01:ts1:0.02
t3=0.01:ts2:0.02
n=-20:40;
xn1=A*cos(w*t1);
xn2=A*cos(w*t2);
xn3=A*cos(w*t3);
subplot(311)
plot(t1,xn1,'d')
subplot(312)
```

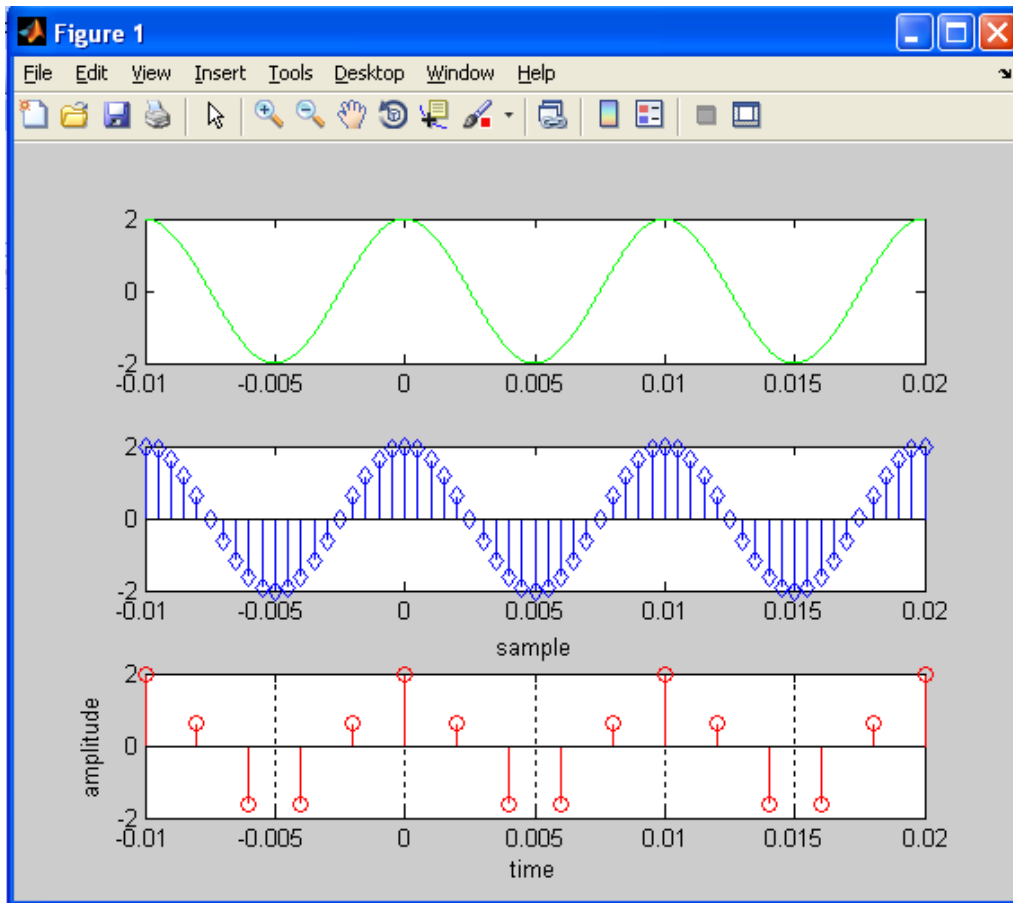
```
stem(t2,xn2,'d')
subplot(313)
stem(t3,xn3,'d')
xlabel('time')
ylabel('amplitude')
title('sample')
grid
```



## Program 2

```
clear all
f=100;
fs1=2000;
fs2=500;
```

```
ts1=1/fs1;
ts2=1/fs2;
d=0;
A=2;
w=2*pi*f;
t1=-0.01:0.00001:0.02
t2=-0.01:ts1:0.02
t3=-0.01:ts2:0.02
n=-20:40;
xn1=A*cos(w*t1);
xn2=A*cos(w*t2);
xn3=A*cos(w*t3);
subplot(311)
plot(t1,xn1,'g')
subplot(312)
stem(t2,xn2,'d')
subplot(313)
stem(t3,xn3,'r')
xlabel('time')
ylabel('amplitude')
title('sample')
grid
```



### Program 3

```
clear all
```

```
N1=24;
```

```
N2=36;
```

```
n1=0:2*N1;
```

```
n2=0:2*N2;
```

```
x1=cos(n1*pi/12);
```

```
x2=cos(n2*pi/18);
```

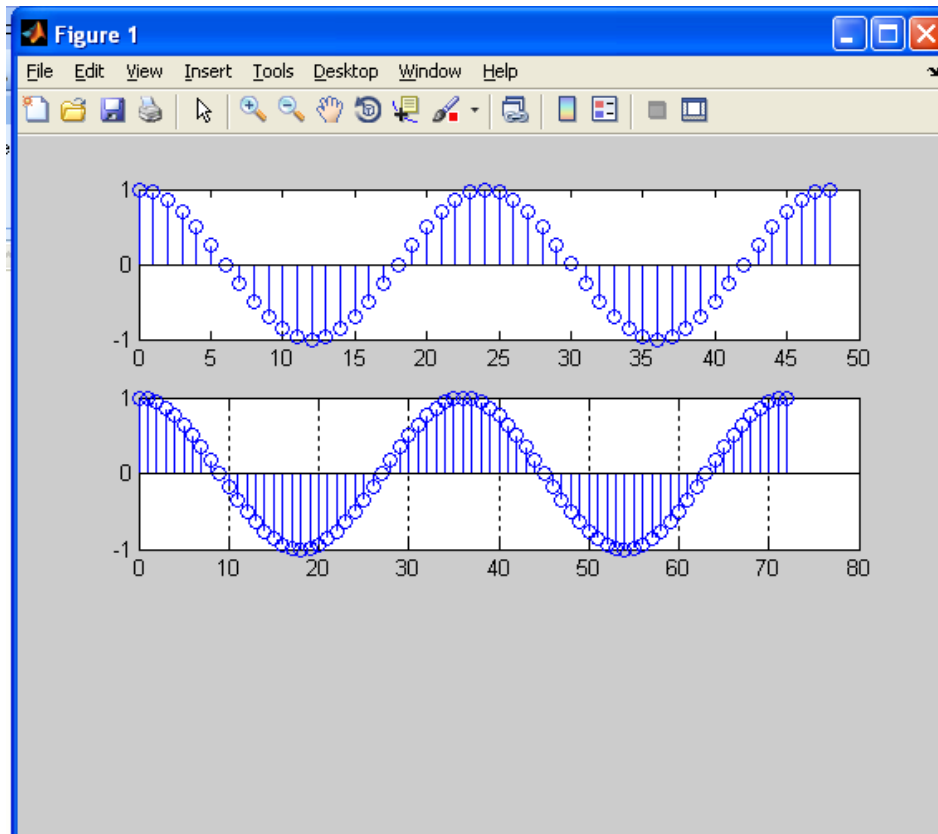
```
subplot(311)
```

```
stem(n1,x1)
```

```
subplot(312)
```

```
stem(n2,x2)
```

```
grid
```



#### Program 4

```
clear all
```

```
N1=24;
```

```
N2=36;
```

```
N3=72;
```

```
n1=0:2*N1;
```

```
n2=0:2*N2;
```

```
n3=0:3*N3
```

```
x1=cos(n1*pi/12);
```

```
x2=cos(n2*pi/18);
```

```
y=cos(n3*pi/12)+cos(n3*pi/18)
```

```
subplot(311)
```

```
stem(n1,x1)
```

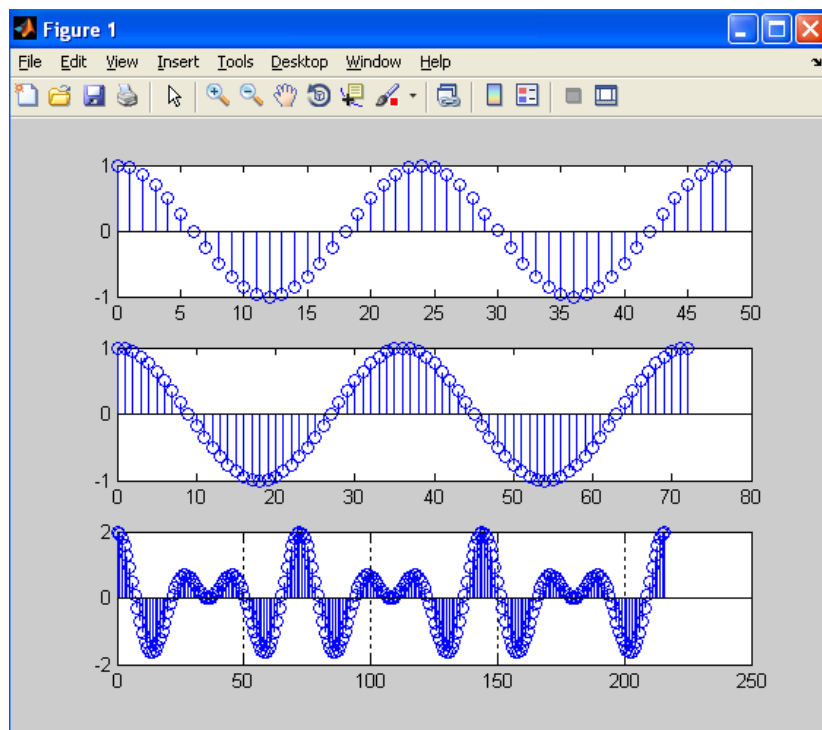
```
subplot(312)
```

```
stem(n2,x2)
```

```
subplot(313)
```

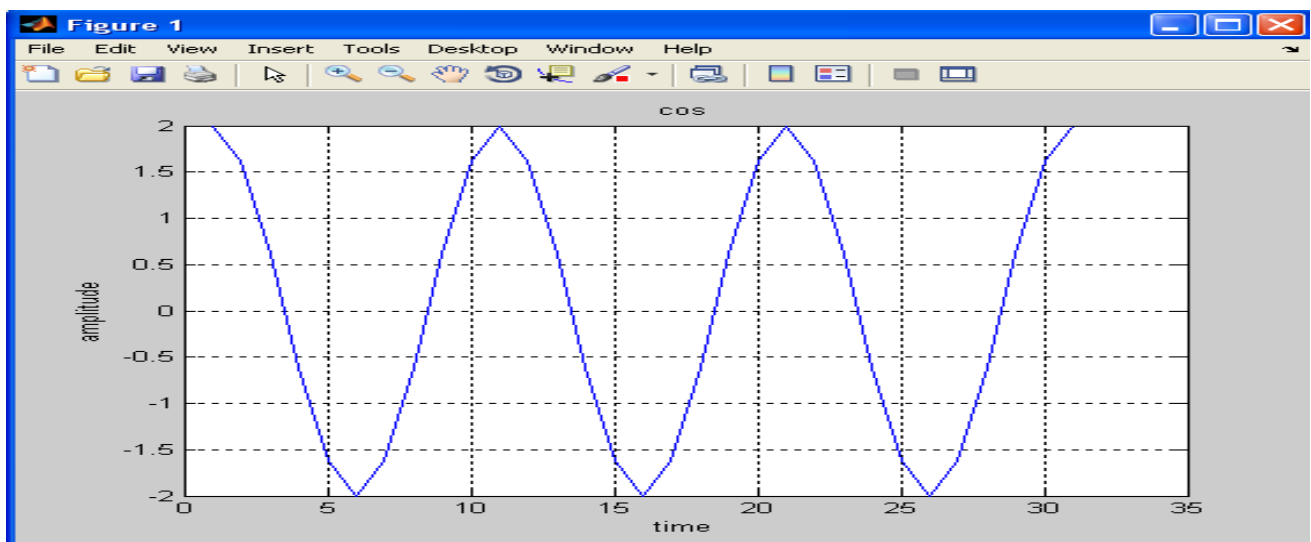
```
stem(n3,y)
```

```
grid
```



## Program 5

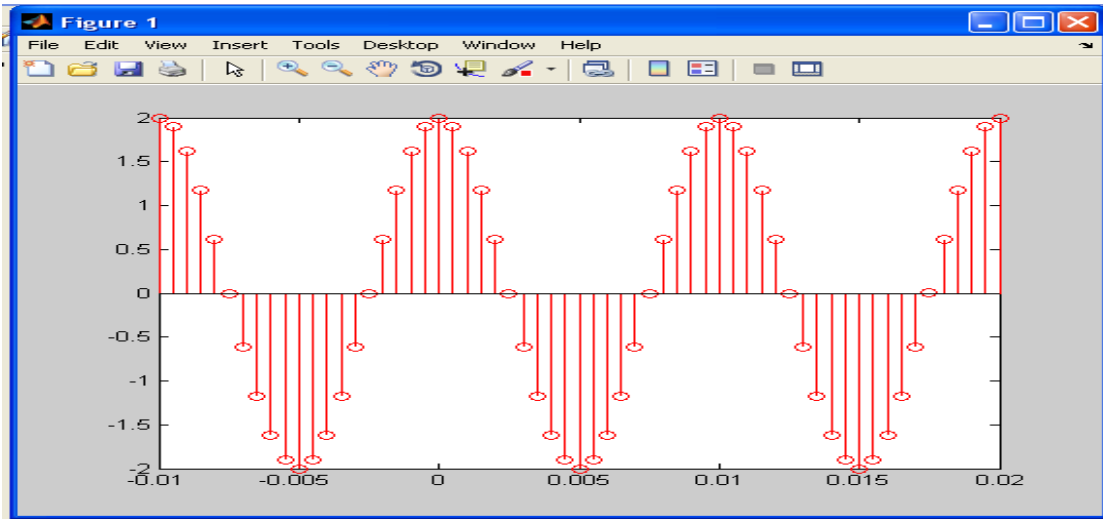
```
clc
clear all
f=100;
d=0;
w=2*pi*f;
A=2;
t=-0.01:0.001:0.02;
xt=A*cos(w*t+d);
plot(xt);
xlabel('time')
ylabel('amplitude')
title('cos')
grid
```



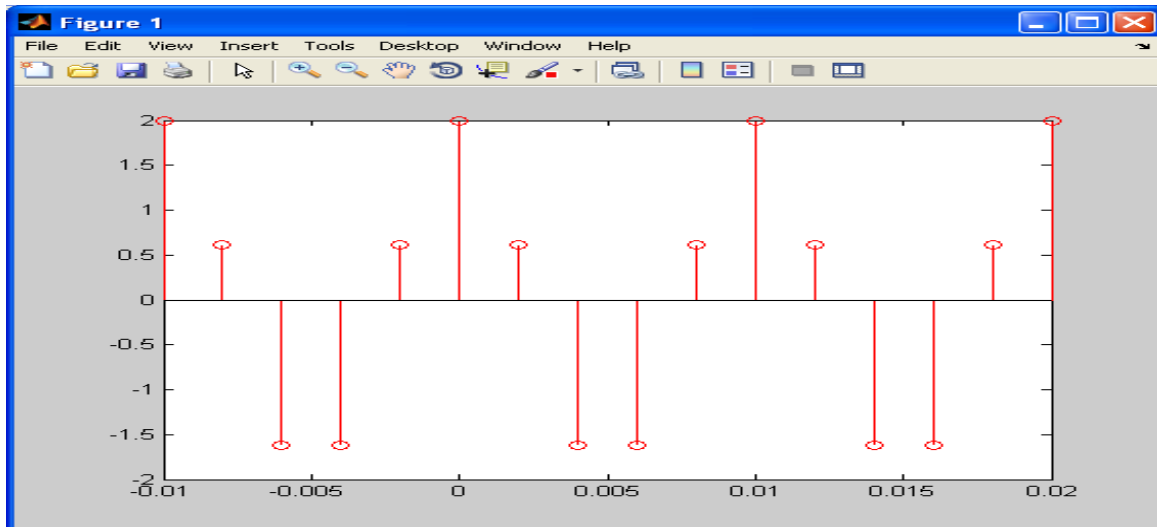


## Program 6

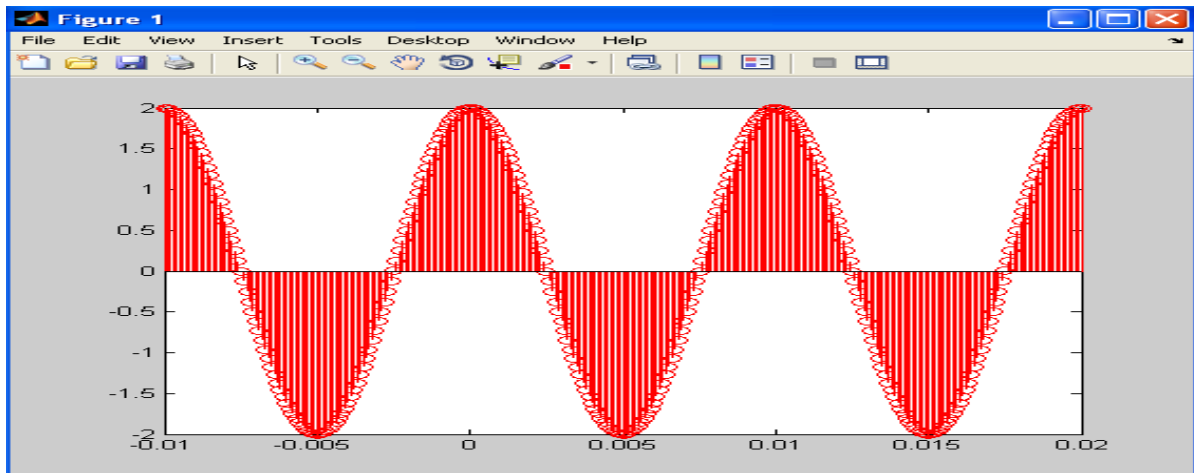
```
clc
clear all
f=100;
fs=2000;
w=2*pi*f;
A=2;
ts=1/fs;
n=-20:40;
t=-0.01:ts:0.02;
xn=A*cos(w*t);
stem(t,xn,'r')
plot(xt);
xlabel('time')
ylabel('amplitude')
title('cos')
grid
```



$F_s=500$



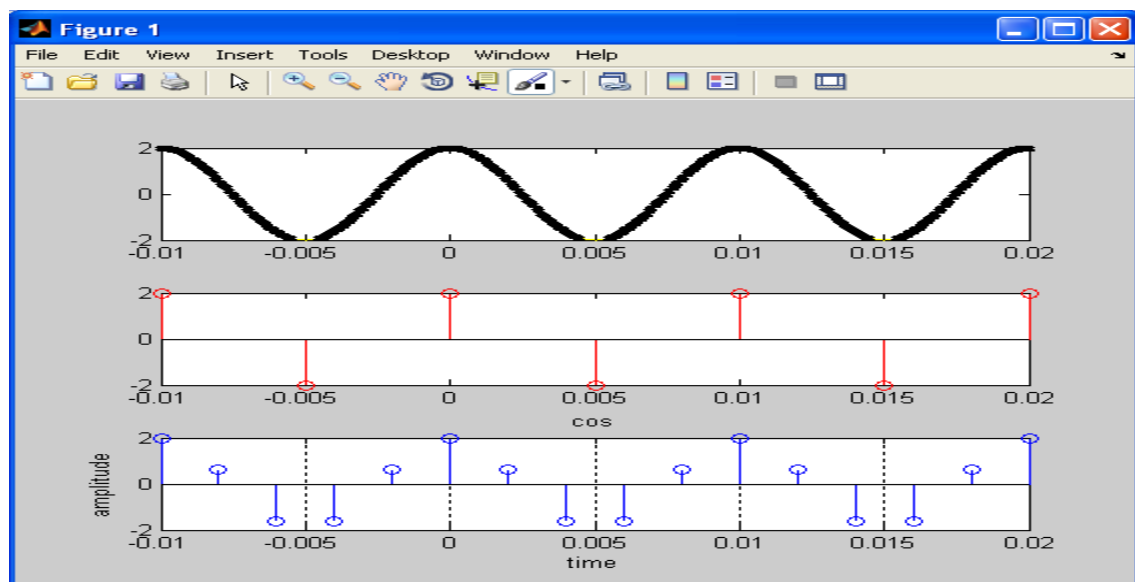
$t=-0.01:0.0001:0.02;$



## Program 7

```
clc
clear all
A=2;
n=-20:40;
f=100;
t=-0.01:0.0001:0.02;
w=2*pi*f;
xt=A*cos(w*t);
subplot(311)
plot(t,xt,'y')
fs=200;
ts=1/fs;
t=-0.01:ts:0.02;
w=2*pi*f;
xn=A*cos(w*t);
subplot(312)
stem(t,xn,'r')
fs=500;
ts=1/fs;
t=-0.01:ts:0.02;
w=2*pi*f;
xn=A*cos(w*t);
```

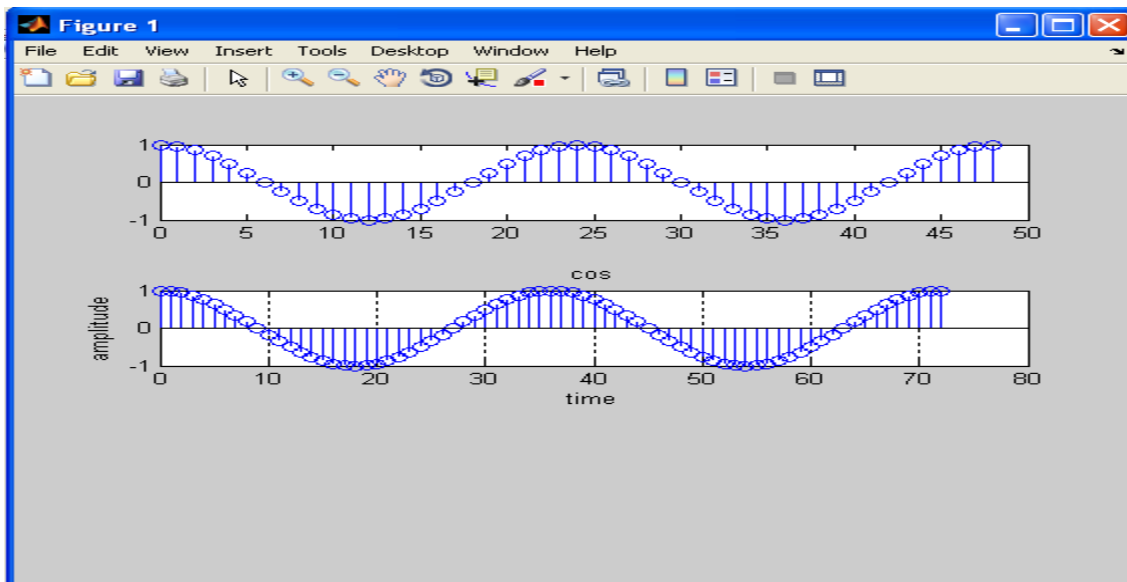
```
subplot(313)
stem(t,xn,'b')
xlabel('time')
ylabel('amplitude')
title('cos')
grid
```



## Program 8

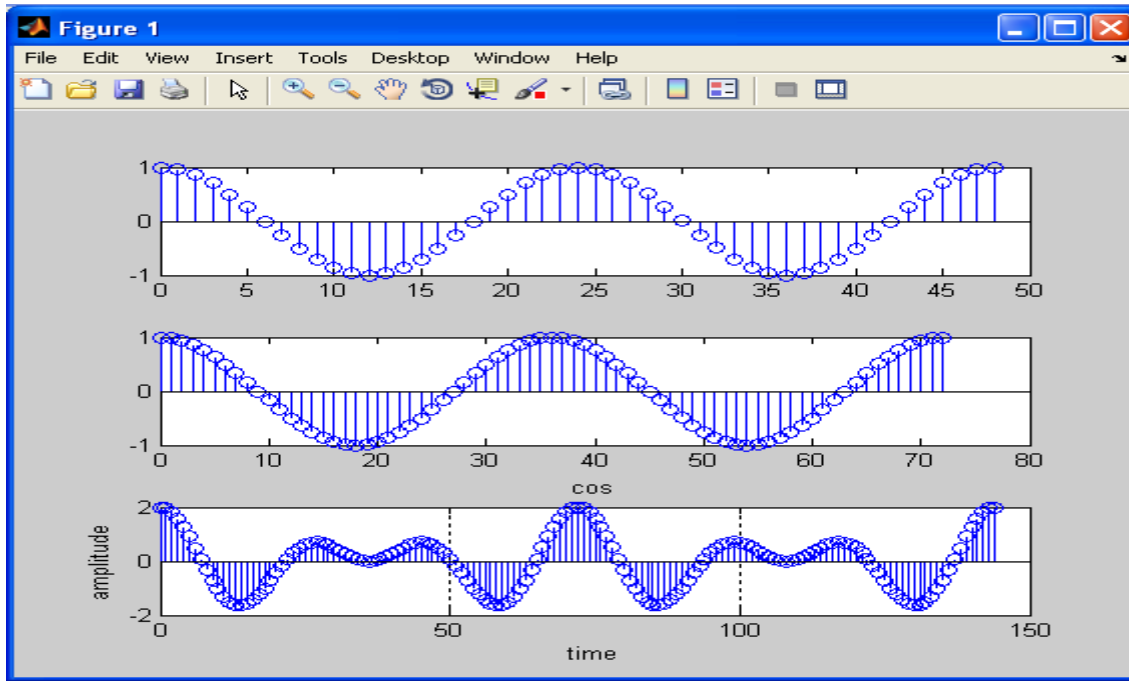
```
clc
clear all
N1=24;
n1=0:2*N1;
N2=36;
```

```
n2=0:2*N2;  
X1=cos(n1*pi/12);  
subplot(311);  
stem(n1,X1);  
X2=cos(n2*pi/18);  
subplot(312);  
stem(n2,X2);  
xlabel('time')  
ylabel('amplitude')  
title('cos')  
grid
```



## Program 9

```
clc
clear all
N1=24;
N2=36;
N3=72;
n1=0:2*N1;
n2=0:2*N2;
n3=0:2*N3;
X1=cos(n1*pi/12);
subplot(311);
stem(n1,X1);
X2=cos(n2*pi/18);
subplot(312);
stem(n2,X2);
y=cos(n3*pi/12)+cos(n3*pi/18);
subplot(313);
stem(n3,y);
xlabel('time')
ylabel('amplitude')
title('cos')
grid
```



## LAB ASSIGNMENT NO: 3

### Convolution:

#### Program 1

```
a=-5;
```

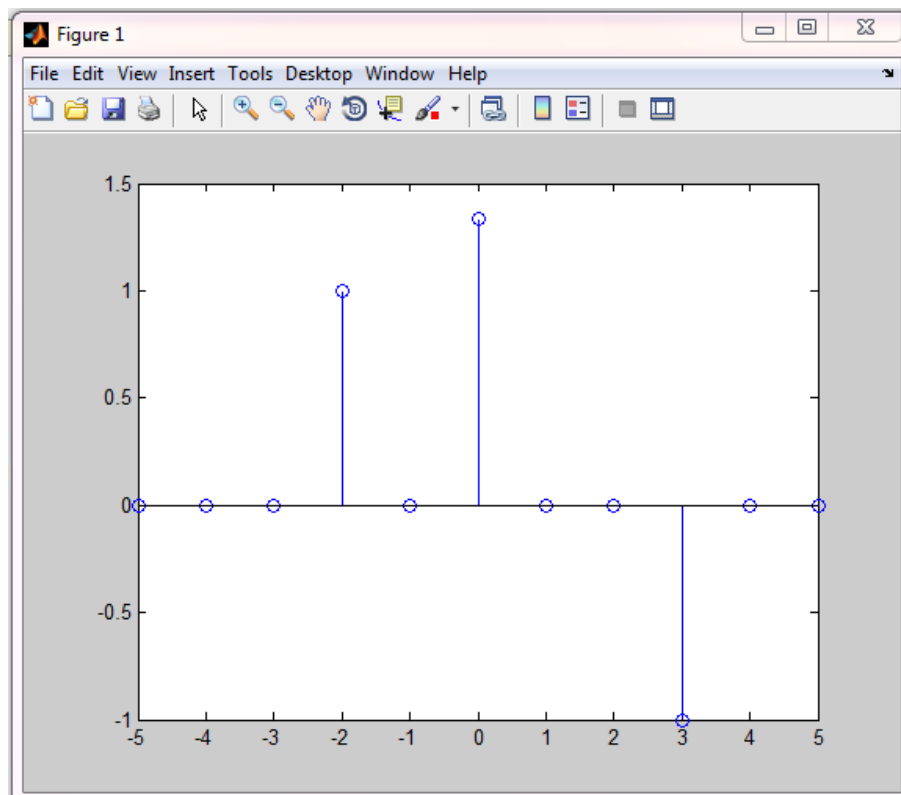
```
b=1;
```

```
c=5;
```

```
n=-5:1:5
```

```
x=[0 0 0 1 0 4/3 0 0 -1 0 0]
```

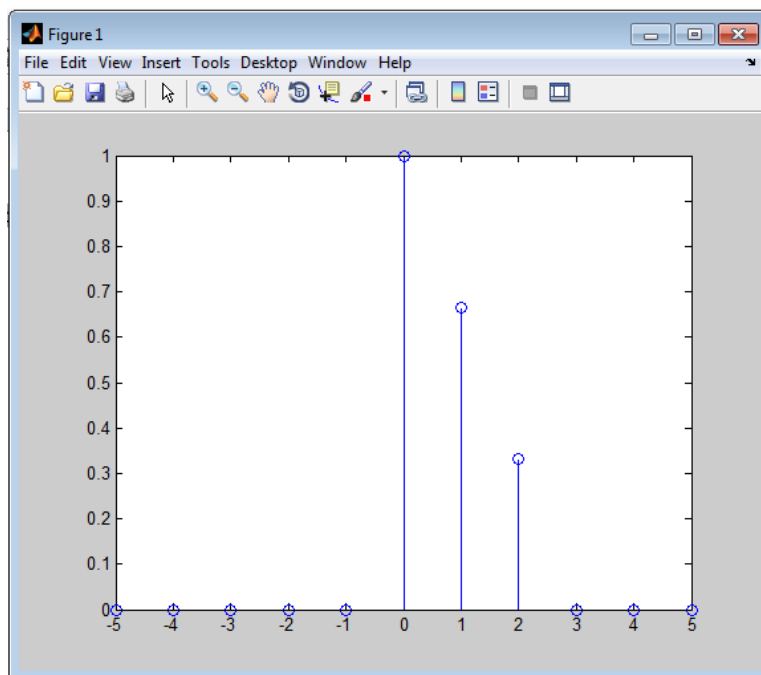
```
stem(n,x)
```





## Program 2

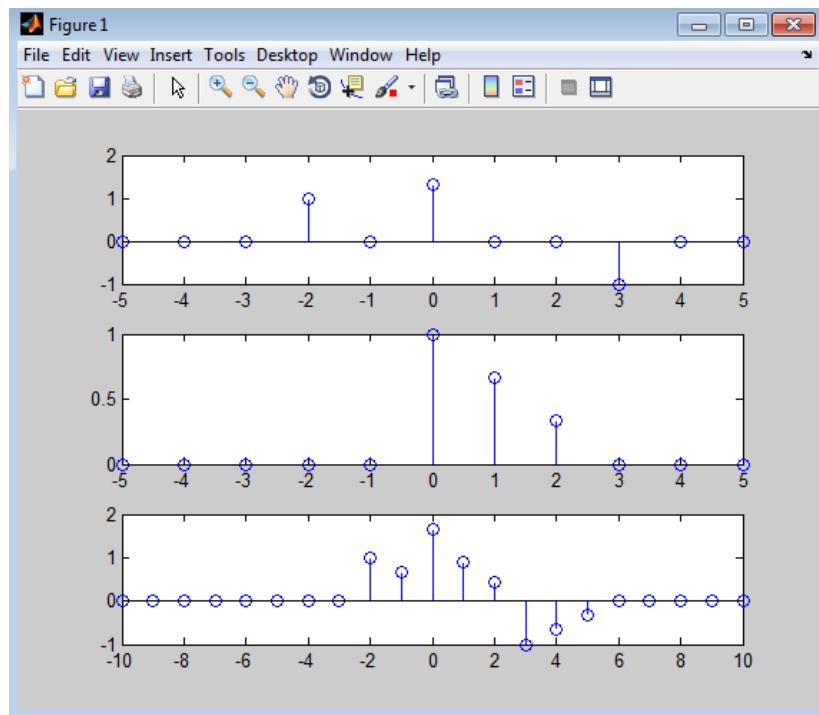
```
clc;  
clear all;  
n=-5:1:5;  
x=[0 0 0 0 0 1 2/3 1/3 0 0 0];  
stem(n,x)
```



## Program 3

```
clc;  
clear all;  
a=-5;
```

```
b=1;
c=5;
n=-5:1:5
x=[0 0 0 1 0 4/3 0 0 -1 0 0]
subplot(311)
stem(n,x)
y=[0 0 0 0 0 1 2/3 1/3 0 0 0];
subplot(312)
stem(n,y)
d=-10:1:10;
h=conv(x,y);
subplot(313)
stem(d,h)
```

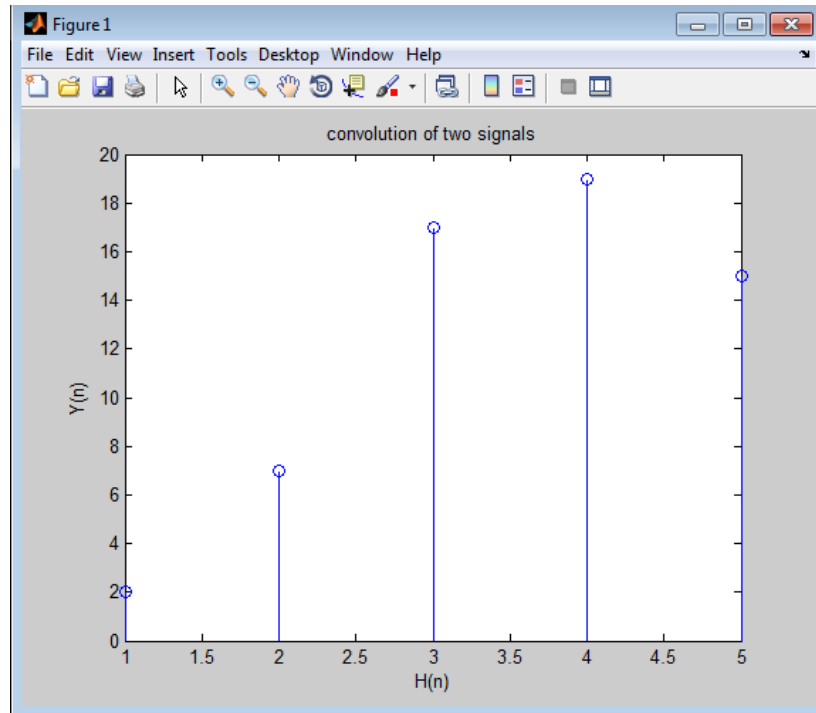


## Program 4

```
clc;
clear all;
x=input('enter the value of x(n):')
h=input('enter the value of h(n):')
n1=length(x);
n2=length(h);
X=[x,zeros(1,n2)];
H=[h,zeros(1,n1)];
for i=1:n1+n2-1;
    Y(i)=0;
    for j=1:n1;
        if(i-j+1>0)
            Y(i)=Y(i)+X(j) * H(i-j+1);
        else
            % Y(i) remains 0
        end
    end
end
stem(Y)
ylabel('Y(n)');
xlabel ('H(n)');
title('convolution of two signals');
```

when  $X(n) = [1 \ 2 \ 3]$

$h(n) = [2 \ 3 \ 5]$



### Program 5

```
clc;
```

```
clear all;
```

```
n=1:1:200;
```

```
sn=2*n.*[0.9.^n];
```

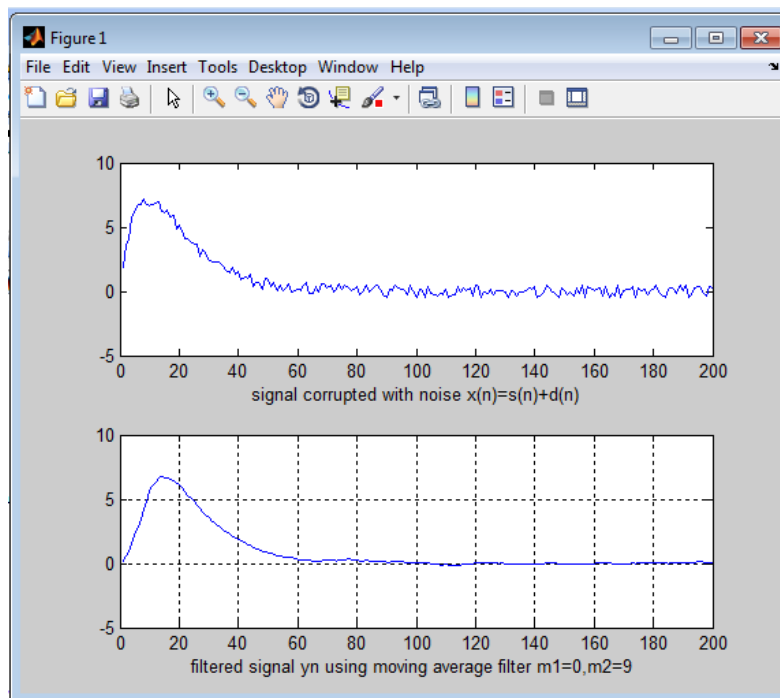
```
dn=rand(1,length(n))-0.5;
```

```
xn=sn+dn;
```

```

m1=0;
m2=9;
hn=(1/(m1+m2+1))* ones(1,m1+m2+1);
yn=conv(xn,hn);
subplot(211);
plot(n,xn);
xlabel('signal corrupted with noise x(n)=s(n)+d(n)');
subplot(212);
plot(n,yn(1:length(n)));
xlabel('filtered signal yn using moving average filter m1=0,m2=9 ');
grid;

```

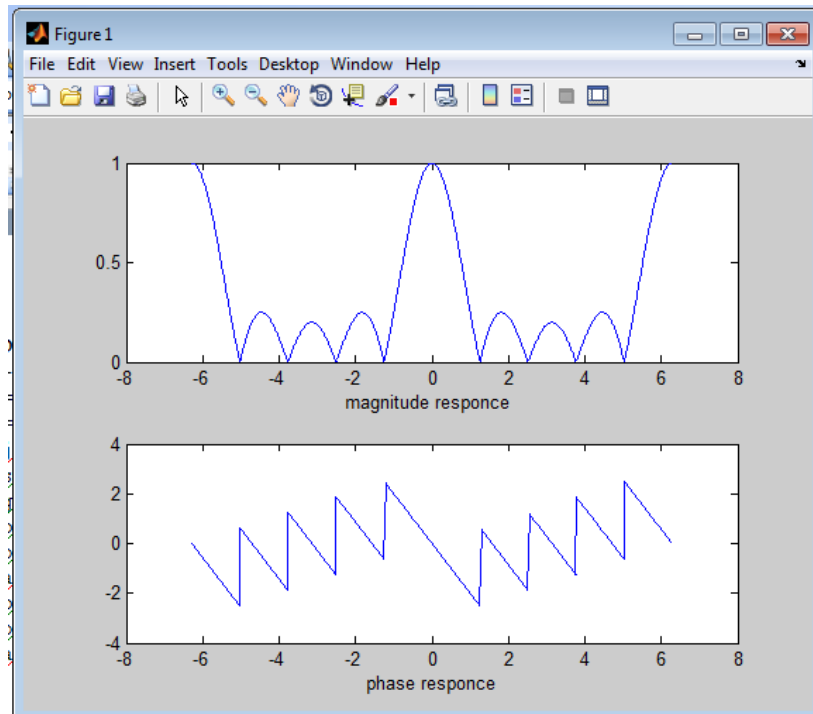


## Program 6

```

w=-2*pi:0.01:2*pi;
m1=0;
m2=4;
Hejw=1/5*(1+exp(-j*w)+exp(-j*w*2)+exp(-j*w*3)+exp(-j*w*4));
abs(Hejw);
angle(Hejw);
subplot(211);
plot(w,abs(Hejw));
xlabel('magnitude response ');
subplot(212);
plot(w,angle(Hejw));
xlabel('phase response');

```



## LAB ASSIGNMENT NO: 4

### Z-transformation:

#### Program 1

```
clc;
syms a n;
xn=a^n
Xz=ztrans(xn)
disp('xn='); pretty(xn);
disp('Xz='); pretty(Xz);
```

```
xn =
a^n

Xz =
-z/(a - z)

xn=|
      n
      a
Xz=
      z
      - ----
      a - z
>>
```

## Program 2

```
clc;
syms n;
xn=(1/2)^n+(-1/3)^n
Xz=ztrans(xn)
disp('xn='); pretty(xn);
disp('Xz='); pretty(Xz);
```

```
xn =
(1/2)^n + (-1/3)^n

Xz =
z/(z - 1/2) + z/(z + 1/3)

xn=

$$\frac{1}{2^n} + \frac{1}{3^n}$$

Xz=

$$\frac{z}{z - \frac{1}{2}} + \frac{z}{z + \frac{1}{3}}$$

>>
```

**Inverse Z-transformation:**



### Program 3

```
clc;
syms a z;
Xz=1/((1-(1/4)*z^-1)*(1-(1/2)*z^-1))
xn=iztrans(Xz)
disp('Xz='); pretty(Xz);
disp('xn='); pretty(xn);
```

```
Xz =
1 / ((1 / (2 * z) - 1) * (1 / (4 * z) - 1))

xn =
2 * (1/2)^n - (1/4)^n

Xz=
          1
-----
 /  1      \ /  1      \
 | ---- - 1 | | ---- - 1 |
 \ 2 z      / \ 4 z      /
xn=
      / 1 \ n      n
      2 | - | - (1/4)
      \ 2 /
>> |
```

### Program 4

```
clc
```

```
Xz=1/(1-3/4*z^-1+1/8*z^-2)
```

```
b=[1]
```

```
a=[1 -3/4 1/8]
```

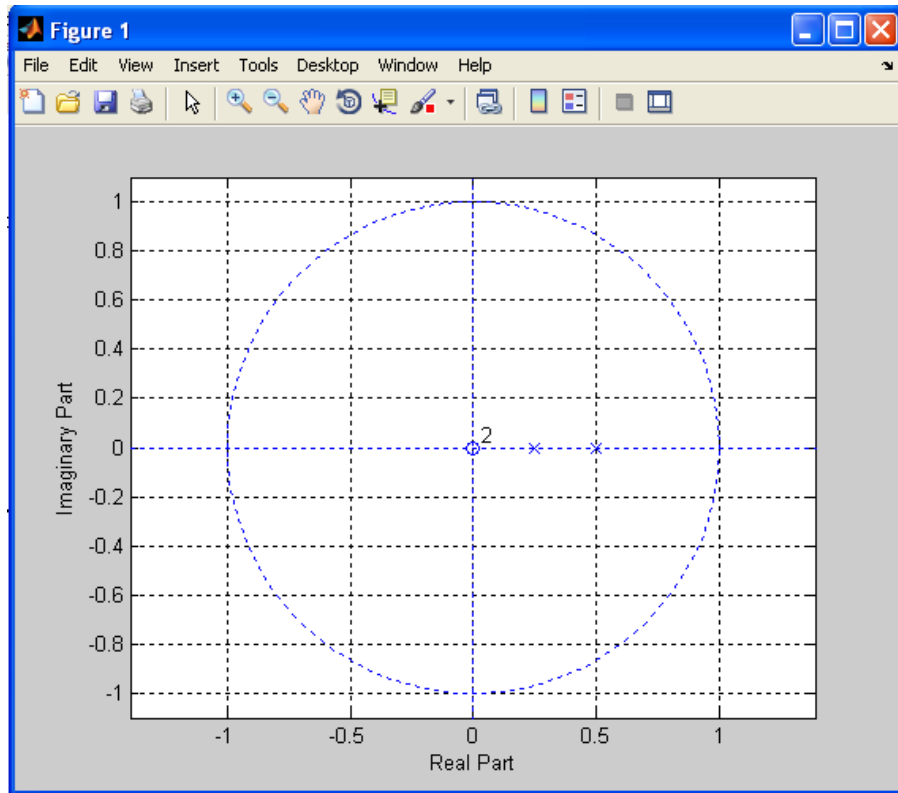
```
zplane(b,a)
```

```
disp('Xz='); pretty(Xz);
```

```
disp('xn='); pretty(xn);
```

```
grid
```

```
Xz =  
  
1 / (1 / (8 * z^2) - 3 / (4 * z) + 1)  
  
b =  
  
    1  
  
a =  
  
    1.0000    -0.7500    0.1250  
  
Xz=  
  
      1  
-----  
      1      3  
----- - ---- + 1  
      2      4 z  
8 z  
xn=  
  
      / 1 \ n      n  
      2 | - | - (1/4)  
      \ 2 /  
>> |
```



## Program 5

```
clc
```

```
p1=1-(1/4)*z^-1
```

```
p2=1-(1/2)*z^-1
```

```
p1=[1 -1/4]
```

```
p2=[1 -1/2]
```

```
p3=conv(p1,p2)
```

```
zplane(p1,p2)
```

p1 =

$$1 - 1/(4*z)$$

p2 =

$$1 - 1/(2*z)$$

p1 =

1.0000 -0.2500

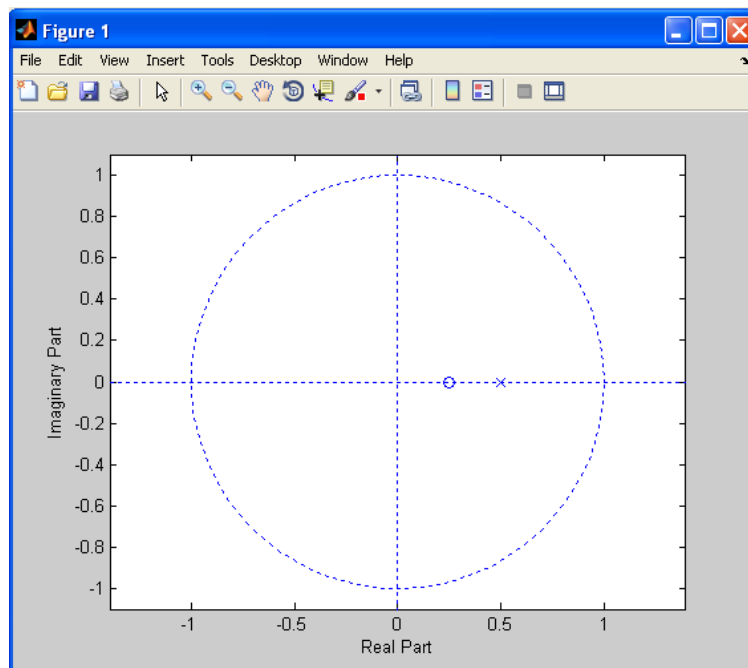
p2 =

1.0000 -0.5000

p3 =

1.0000 -0.7500 0.1250

>> |



## Program 6

```
clc
```

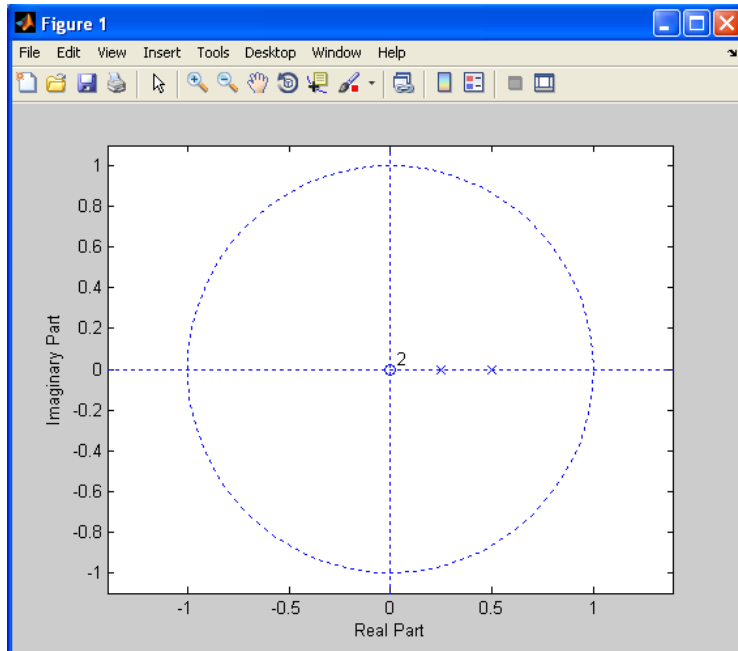
```
b=[1]
```

```
a=[1 -3/4 1/8]
```

```
[r p k]=residue(b,a)
```

```
zplane(b,a)
```

```
b =  
    1  
  
a =  
    1.0000   -0.7500    0.1250  
  
r =  
    4  
   -4  
  
p =  
    0.5000  
    0.2500  
  
k =  
    []  
  
>>
```



## Program 7

```
clc
```

```
clear all
```

```
b=[1 2 1]
```

```
a=[1 -3/2 1/2]
```

```
[z p k]=tf2zp(b,a)
```

b =

1 2 1

a =

1.0000 -1.5000 0.5000

z =

-1  
-1

p =

1.0000  
0.5000

k =

1

>>

## LAB ASSIGNMENT NO: 5

### DFT:

#### Program 1

```
clc
```

```
clear all
```

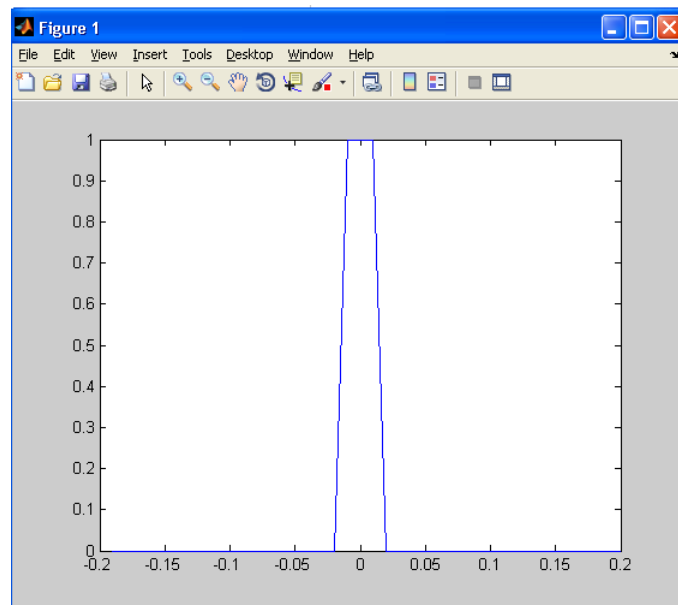
```
inc=0.01
```

```
t=-0.2+inc:inc:0.2
```

```
w=0.025
```

```
ra=rectpuls(t,w)
```

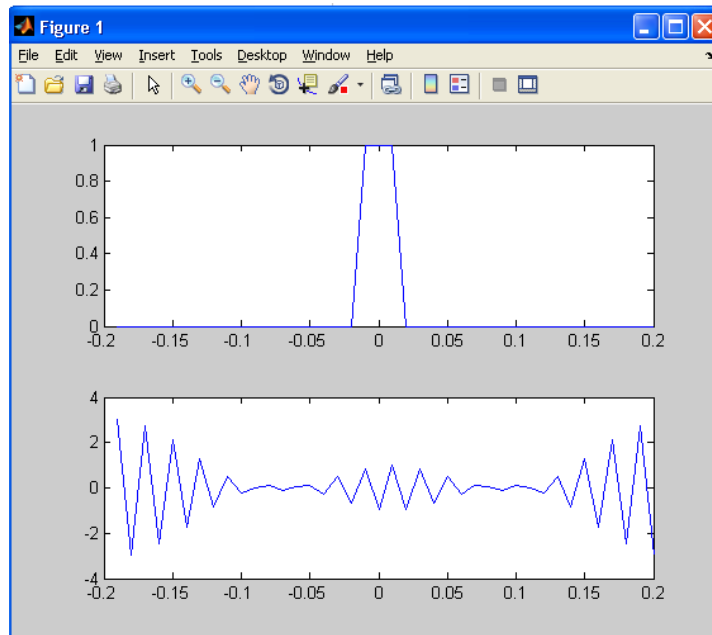
```
plot(t,ra)
```



#### Program 2



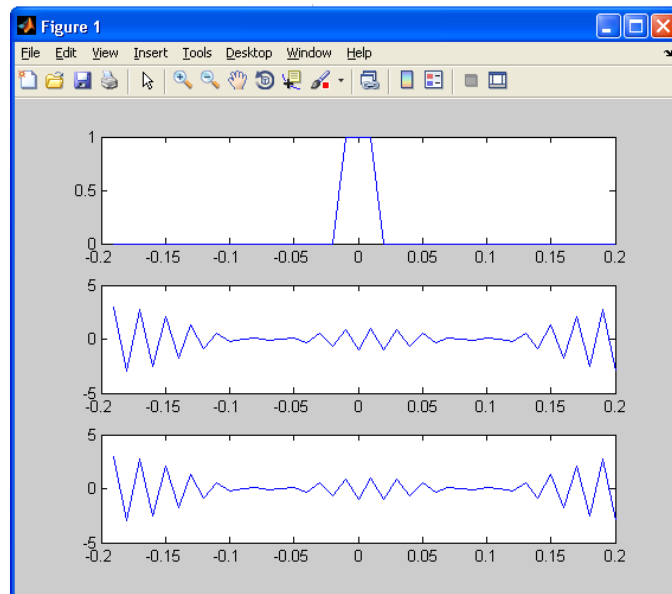
```
clc
clear all
inc=0.01
t=-0.2+inc:inc:0.2
w=0.025
ra=rectpuls(t,w)
subplot(211)
plot(t,ra)
freq=fft(ra)
subplot(212)
plot(t,freq)
```



### Program 3

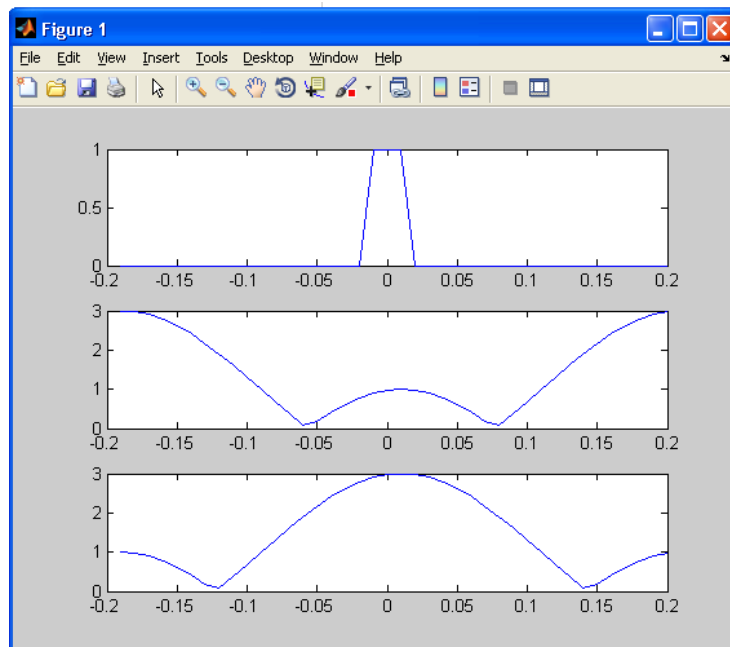
```
clc
```

```
clear all
inc=0.01
t=-0.2+inc:inc:0.2
w=0.025
ra=rectpuls(t,w)
subplot(311)
plot(t,ra)
freq=fft(ra)
subplot(312)
plot(t,freq)
fft2=fftshift(freq)
subplot(313)
plot(t,fft2)
```



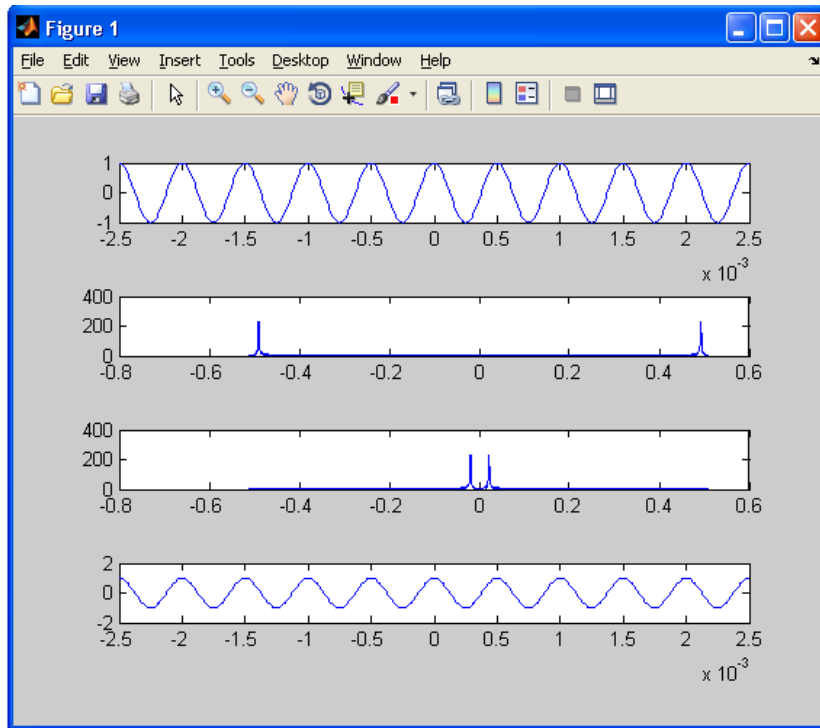
#### Program 4

```
clc
clear all
inc=0.01
t=-0.2+inc:inc:0.2
w=0.025
ra=rectpuls(t,w)
subplot(311)
plot(t,ra)
freq=fft(ra)
subplot(312)
plot(t,abs(freq))
fft2=fftshift(freq)
subplot(313)
plot(t,abs(fft2))
```



## Program 5

```
clc
clear all
t=1/2000
n=2^10
inc=t/50
t=-5*t:inc:5*t
l=length(t)
xt=cos(4000*pi*t)
y=fft(xt,n)
z=abs(y)
i=ifft(y,n)
f=(-n/2)+1:n/2
subplot(411)
plot(t,xt)
subplot(412)
plot(f/1000,z)
subplot(413)
plot(f/1000,fftshift(z))
subplot(414)
plot(t,i(1:501))
```



## LAB ASSIGNMENT NO: 6

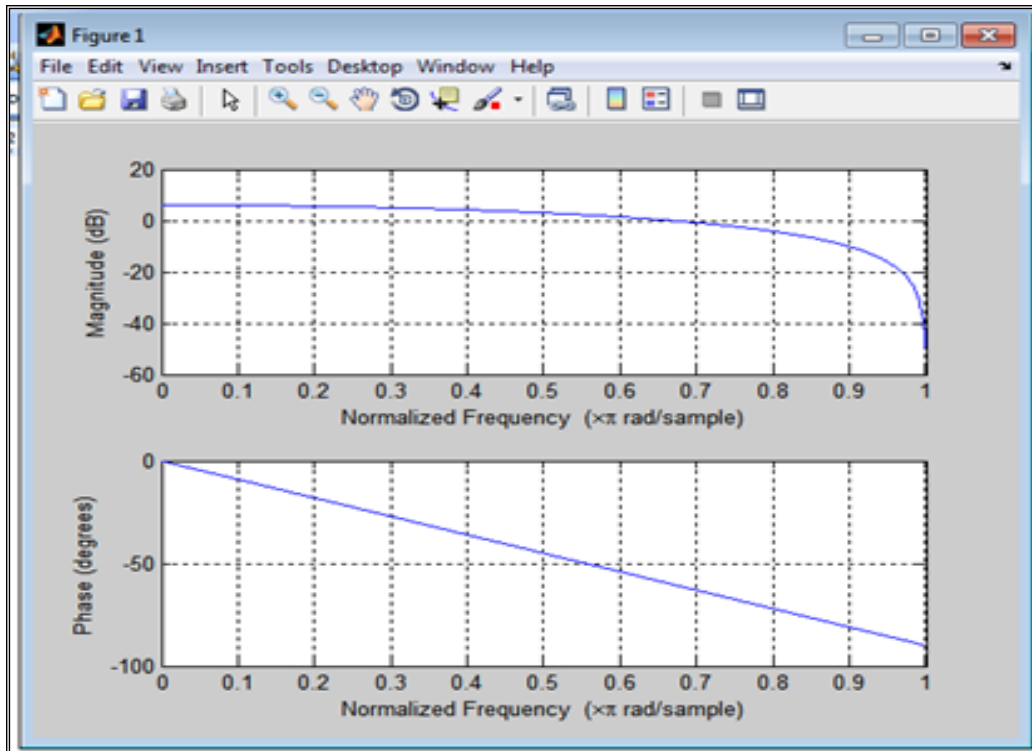
### Low pass filter:

#### Program 1

```
clear all
clc
a=[1 0]
b=[1 1]
N=1000
freqz(b,a,N)
```

#### Output

```
a = 1    0
b = 1    1
N =1000
```



## Program 2

```
clear all
```

```
clc
```

```
a=[1 0]
```

```
b=[1 1]
```

```
N=1000
```

```
freqz(b,a,N);
```

```
figure;
```

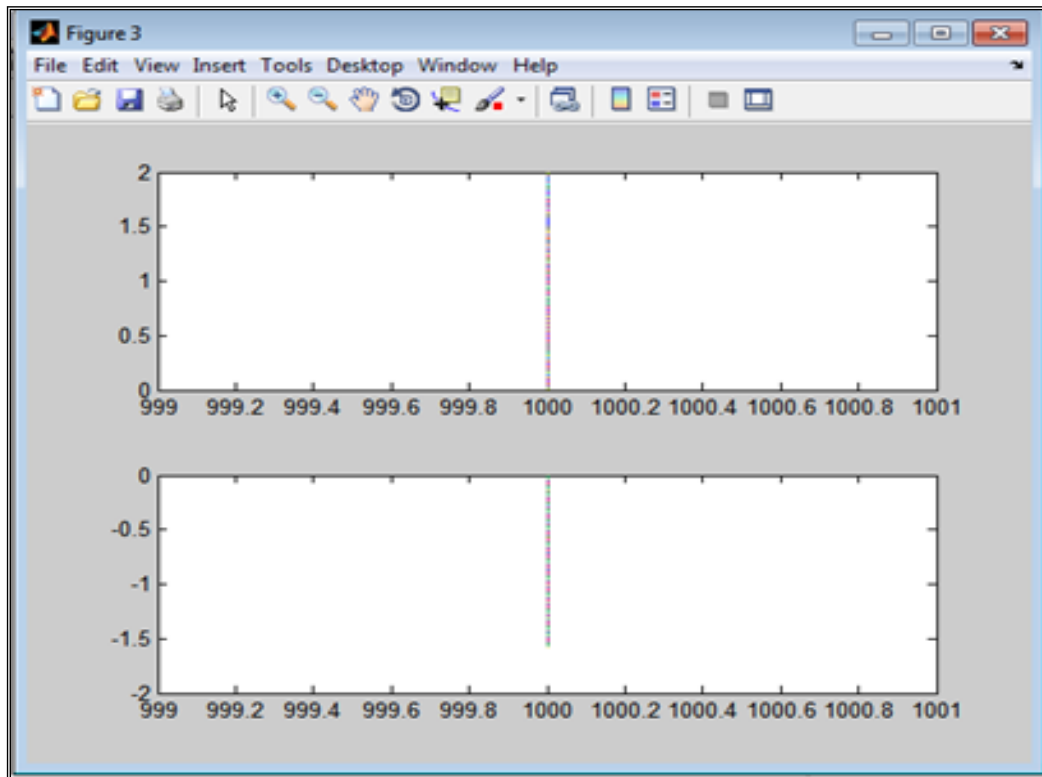
```
[H,w]=freqz(b,a,N);
```

```
subplot(211)
```

```
plot(N,abs(H))
```

```
subplot(212)
```

```
plot(N,angle(H))
```



### Program 3

```
clear all
```

```
clc
```

```
a=[1 0]
```

```
b=[1 1]
```

```
w=0*pi:0.01:pi
```

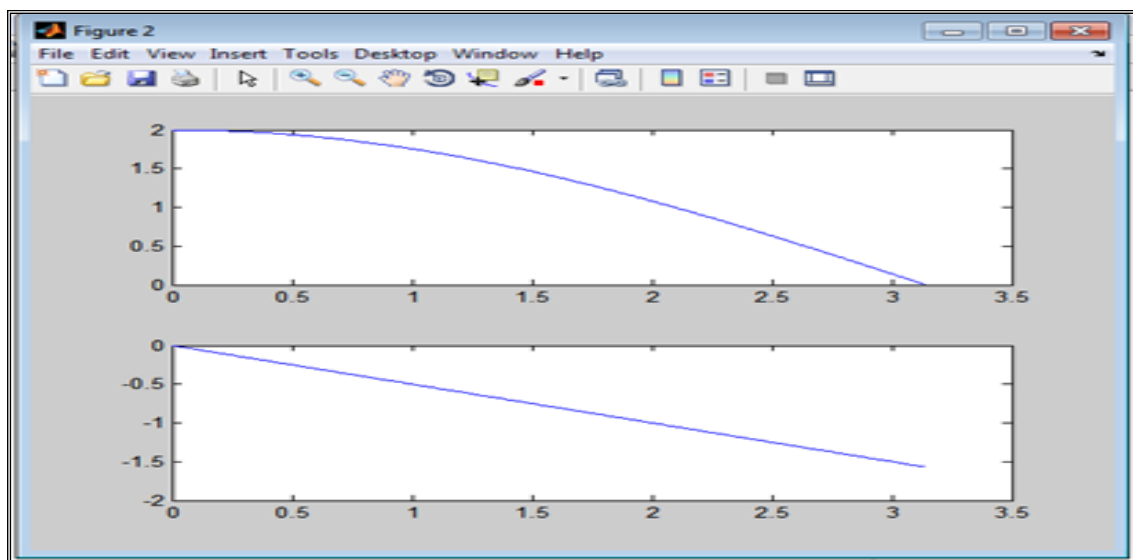


```
freqz(b,a,w);  
figure;  
H=freqz(b,a,w);  
subplot(211)  
plot(w,abs(H))  
subplot(212)  
plot(w,angle(H))
```

## Output

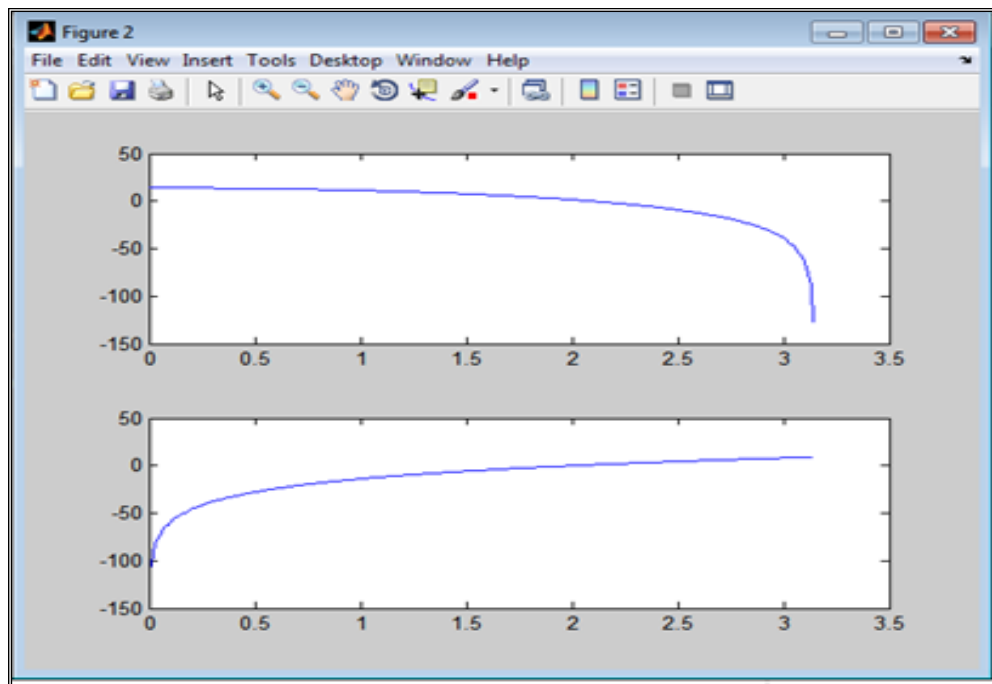
a =1 0

b =1 1



## Program 4

```
clear all
clc
a=[1 0]
b=[1 1]
w=0*pi:0.01:pi
freqz(b,a,w);
figure;
H=freqz(b,a,w);
subplot(211)
plot(w,20*log(abs(H)))
subplot(212)
plot(w,20*log(angle(H)))
```



## Program 5

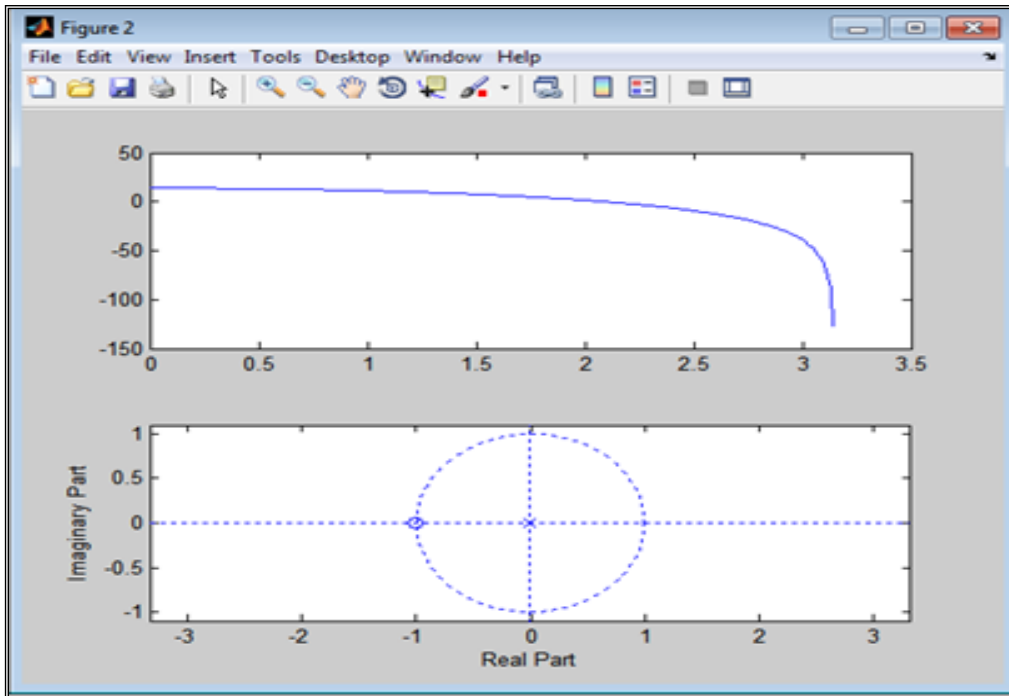
```
clear all
clc
a=[1 0]
b=[1 1]
figure;
w=0*pi:0.01:pi
H=freqz(b,a,w);
subplot(211)
plot(w,20*log(abs(H)))
subplot(212)
plot(w,20*log(angle(H)))
[z,p,k]=tf2zp(b,a)
zplane(z,p)
```

## Output

z =-1

p =0

k =1



## Program 6

```
clear all  
clc  
a=[1 0]  
b=[1 1]  
figure;  
[z,p,k]=tf2zp(b,a)  
zplane(z,p)
```

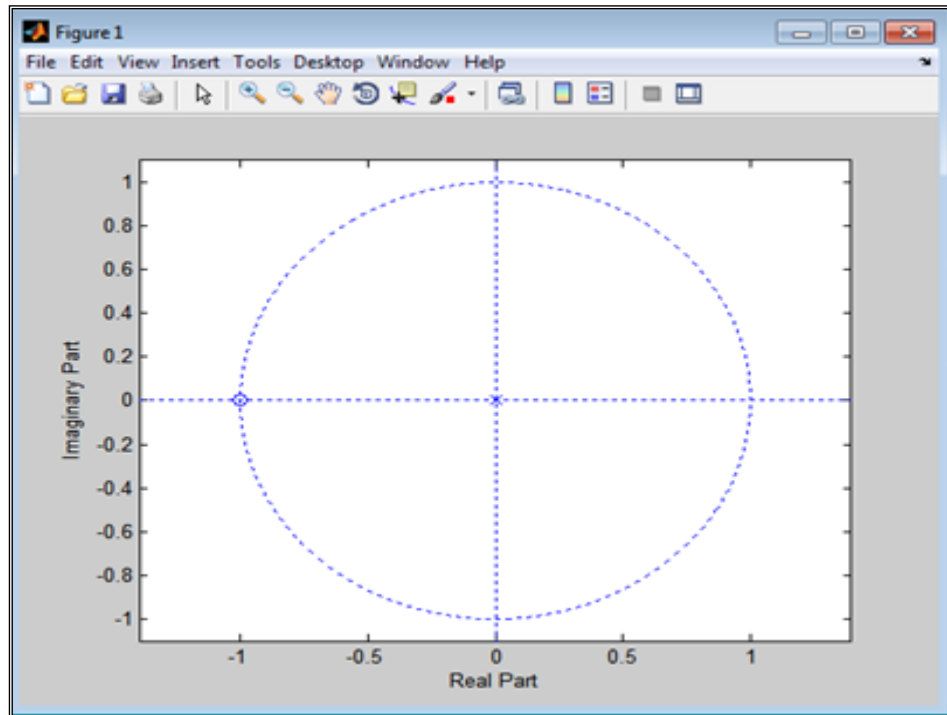
## Output

$a = 1 \quad 0$

$b = 1 \quad 1$

$z = -1$

$p = 0$



**High pass filter:**

**Program 7**

clear all

clc

$a=[1 \ 0]$

```
b=[1 -1]
N=1000
freqz(b,a,N)
```

## Output

```
a = 1  0
b = 1  -1
N = 1000
```

