Experiment No 2

ii) Linear Convolution

```
clear all;
close all;
x=input('Enter the first input sequence x[n] ');
h=input('Enter the first input sequence h[n] ');
Lx=length(x);
Lh=length(h);
len=Lx+Lh -1;

for n=1:len
    y(n)=0;
    for k=1:Lx
        if((n-k)>=0&(n-k)<Lh)
            y(n)=y(n)+x(k).*h(n-k+1);
        end
    end
end
disp('Linear Convolution of x[n] & h[n] is ')
disp(y)
```

Result

Enter the first input sequence x[n] [1 2 3 4]
Enter the first input sequence h[n] [1 0 1]
Linear Convolution of x[n] & h[n] is
  1 2 4 6 3 4

ii) Circular Convolution

```
clear all;
close all;
x1=input('Enter the first input sequence x1[n] ');
x2=input('Enter the first input sequence x2[n] ');
Lx1=length(x1);
Lx2=length(x2);
len=max(Lx1,Lx2);
if Lx1<len
    x1=[x1,zeros(len-Lx1)];
else
    x2=[x2,zeros(len-Lx2)];
end

for n=1:len
    y(n)=0;
    for k=1:len
        i=n-k+1;
        if(i<=0)
```

```
            i=i+len;
        end
        y(n)=y(n)+x2(k)*x1(i);
    end
end
disp('Circular Convolution of x1[n] & x2[n] is ')
disp(y)
```

Result

Enter the first input sequence x1[n] [1 2 3 4]
Enter the first input sequence x2[n] [1 0 1]
Circular Convolution of x1[n] & x2[n] is
  4 6 4 6

iii) Autocorrelation

```
clear all;
close all;
x=input('Enter the input sequence x[n]');
Lx=length(x)-1;
h=fliplr(x);
rxx=conv(x,h);
disp('Auto Corelation of x[n] is rxx[n]')
disp(rxx)

%Verification using builtin function xcorr()
z=xcorr(x,x);
disp('Auto Corelation of x[n] using builtin function is
z[n]')
disp(z)

%Auto correlation using for loop
len=2*Lx+1;
for n=1:len
    Rxx(n)=0;
    for k=1:Lx+1
        if((n-k)>=0 & (n-k)<=Lx)
            Rxx(n)=Rxx(n)+x(k).*h(n-k+1);
        end
    end
end
disp('Auto Corelation of x[n] is Rxx[n]')
disp(Rxx)

%Ploting the graph
a=0:Lx;
subplot(2,2,1)
```

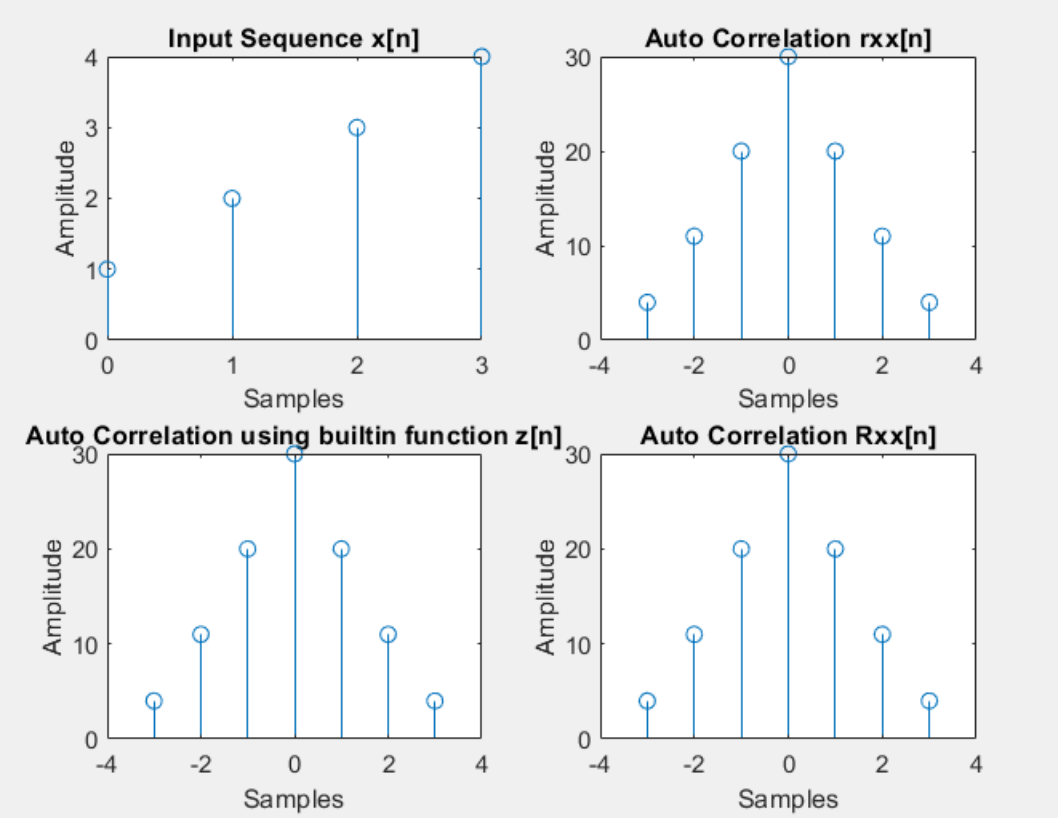
```
stem(a,x)
title('Input Sequence x[n]')
xlabel('Samples')
ylabel('Amplitude')

b=(-Lx):Lx;
subplot(2,2,2)
stem(b,Rxx)
title('Auto Correlation rxx[n]')
xlabel('Samples')
ylabel('Amplitude')

subplot(2,2,3)
stem(b,z)
title('Auto Correlation using builtin function z[n]')
xlabel('Samples')
ylabel('Amplitude')

subplot(2,2,4)
stem(b,z)
title('Auto Correlation Rxx[n]')
xlabel('Samples')
ylabel('Amplitude')
```

Result

Enter the input sequence x[n][1 2 3 4]
Auto Corelation of x[n] is rxx[n]
4 11 20 30 20 11 4

Auto Corelation of x[n] using builtin function is z[n]
4.0000 11.0000 20.0000 30.0000 20.0000 11.0000 4.0000

Auto Corelation of x[n] is Rxx[n]
4 11 20 30 20 11 4



iv) Cross Correlation

```
clear all;
close all;
x=input('Enter the input sequence x[n]');
Lx=length(x)-1;
h=input('Enter the second sequence h[n]');
Lh=length(h)-1;
y=fliplr(h);
Rxy=conv(x,y);
disp('Cross Correlation is Rxy[n]')
disp(Rxy)

%Verification using builtin function xcorr()
z=xcorr(x,h);
disp('Cross Correlation using builtin function is z[n]')
disp(z)

%Cross correlation using for loop
len=Lx+Lh+1;
for n=1:len
    rxx(n)=0;
    for k=1:Lx+1
        if((n-k)>=0 & (n-k)<=Lh)
            rxx(n)=rxx(n)+x(k).*y(n-k+1);
```

```
        end
    end
end
disp('Cross Correlation of x[n] is Z[n]')
disp(rxx)

a=0:Lx;
subplot(3,2,1)
stem(a,x)
title('First Input Sequence x[n]')
xlabel('Samples')
ylabel('Amplitude')

b=0:Lh;
subplot(3,2,2)
stem(a,h)
title('Second Input Sequence y[n]')
xlabel('Samples')
ylabel('Amplitude')

c=(-Lx):Lx;
subplot(3,2,3)
stem(c,Rxy)
title('Cross Correlation Rxy[n] using builtin function
xcorr()')
xlabel('Samples')
ylabel('Amplitude')

subplot(3,2,4)
stem(c,z)
title('Cross Correlation using builtin function xcorr()
z[n]')
xlabel('Samples')
ylabel('Amplitude')

subplot(3,2,5:6)
stem(c,rxx)
title('Cross Correlation rxx[n]')
xlabel('Samples')
ylabel('Amplitude')
```

Result

Enter the input sequence x[n][1 2 3 4]
Enter the second sequence h[n][4 3 2 1]
Cross Correlation is Rxy[n]
1 4 10 20 25 24 16

Cross Correlation using builtin function is z[n]

1.0000 4.0000 10.0000 20.0000 25.0000 24.0000 16.0000

Cross Correlation of x[n] is Z[n]

1 4 10 20 25 24 16