LNCT GROUP OF COLLEGES
"WORKING TOWARDS BEING THE BEST"

Name of Student: _____

Enrolment No.: _____

Class: _____

Section: _____

Session: _____

Department of Electronics and Communication Engineering
LAKSHMI NARAIN COLLEGE OF TECHNOLOGY & SCIENCE BHOPAL
Kalchuri Nagar, Raisen Road Bhopal (MP) 462023

LAKSHMI NARAIN COLLEGE OF TECHNOLOGY & SCIENCE, BHOPAL

Vision and Mission of the Department

Vision

To be world-wide recognized for adopting and keeping innovation and entrepreneurship mindset as abreast of learning to produce professionals as valuable, ethical and moral resource for industry and society.

Mission

- To establish an ecosystem where students could grow with innovative practices followed in communication engineering.
- Adopt the global approaches to transform the young aspirant into engineering professional catering the society with ethical and patriotic zeal.
- Facilitate and felicitate the learners to have close interactions with the industry experts and researchers for keeping them updated of the current and future needs of the society.
- To develop the mindset of learners for being innovative and entrepreneurial in becoming successful professional.

Program Specific Outcomes (PSO's)

1. To analyze, design and develop solutions of real time problems and industry needs.
2. Ability of effectively communicating with the professionals and preparation of reports, documents and presentation while working in teams.
3. Knowledge and understanding of latest developments in the field of VLSI, Embedded system, Networking, Matlab and other major tools necessary for keeping pace with the industry.
4. Ability of solving complex engineering problems with ethical and law full approach to prevent the society and environment from adverse impacts.

Program Educational Objectives (PEO's)

1. The graduate will have the knowledge and skills of analog and digital communication in providing necessary solutions to the real world problems.
2. The graduate will be able to design, develop, analyze and implement the modern tools and systems involving principles of electronics and telecommunication engineering.
3. The graduate will be following the ethical practices of the core industry and supporting software industry in providing most acceptable solution to the society.
4. The graduate will have the innovative mindset of learning and implementing the latest technological advancements and research outcomes in the electronic hardware and software to keep pace with the rapid developments in socio economic world.

Code of Conducts for the Laboratory

- All bags must be left at the indicated place.
- The lab timetable must be strictly followed.
- Be **PUNCTUAL** for your laboratory session.
- Noise must be kept to a minimum.
- Workspace must be kept clean and tidy at all time.
- Handle the experiment kit and interfacing its with care.
- All students are liable for any damage to the accessories due to their own negligence.
- Students are strictly **PROHIBITED** from taking out any items from the laboratory.
- Students are **NOT** allowed to work alone in the laboratory without the Lab Supervisor
- Report immediately to the Lab Supervisor if any malfunction of the accessories, is there.
- Before leaving the lab Place the stools properly.
- Please check the laboratory notice board regularly for updates.

LAKSHMI NARAIN COLLEGE OF TECHNOLOGY & SCIENCE, BHOPAL

INDEX

Name of Student:_____ Enrolment No.:_____

Sl. No.	Title of the Experiment	Date of Experiment	Date of Submission	Remark
1	Write a program for Generation of Continuous and Discrete Unit Step Function Signal.			
2	Write a program for Generation of Ramp and exponential signal in Continuous and Discrete domain.			
3	Write a program for addition and subtraction of two given signal (discrete and continuous domain)			
4	Write a program to generate the sample, unit step, ramp and exponential signal.			
5	Write a program to generate signal shifting, folding, addition and multiplication.			
6	Write a program for Generation of circular convolution without using built in function in Scilab/ MATLAB			
7	FFT of a sequence using DIT-FFT method			
8	Implementation of Linear convolution using DFT (Overlap-add and Overlap-Save methods)			
9	Implementation of IIR digital filter using Butterworth method and bilinear transformation method.			
10	To develop program for computing DFT			

Date of Experiment: _____

EXPERIMENT NO.:- 1

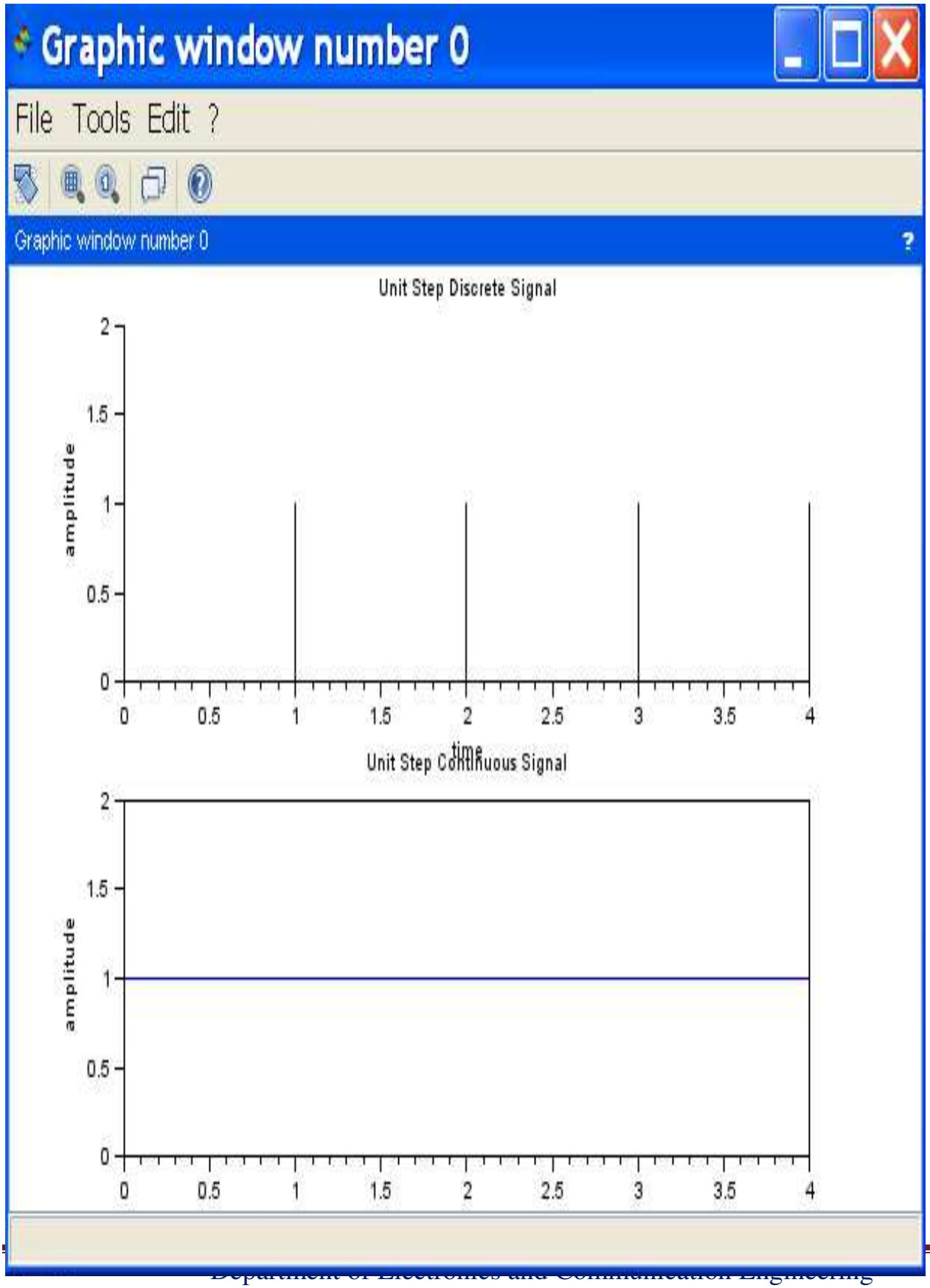
Aim:- Write a program for Generation of Continuous and Discrete Unit Step Function Signal.

TOOL:- SCILAB /MATLAB

Program:-

```
t=0:4;
y=ones(1,5);
subplot(2,1,1);
plot2d3 (t,y);
xlabel('time');
ylabel('amplitude');
title('Unit Step Discrete Signal');
subplot(2,1,2);
plot(t,y);
xlabel('time');
ylabel('amplitude');
title('Unit Step Continuous Signal');
```

Output:


Graphic window number 0
File Tools Edit ?
Graphic window number 0
Unit Step Discrete Signal
amplitude
time
Unit Step Continuous Signal
amplitude

Date of Experiment: _____

EXPERIMENT NO.:- 2

Aim:- Write a program for Generation of Ramp and exponential signal in Continuous and Discrete domain.

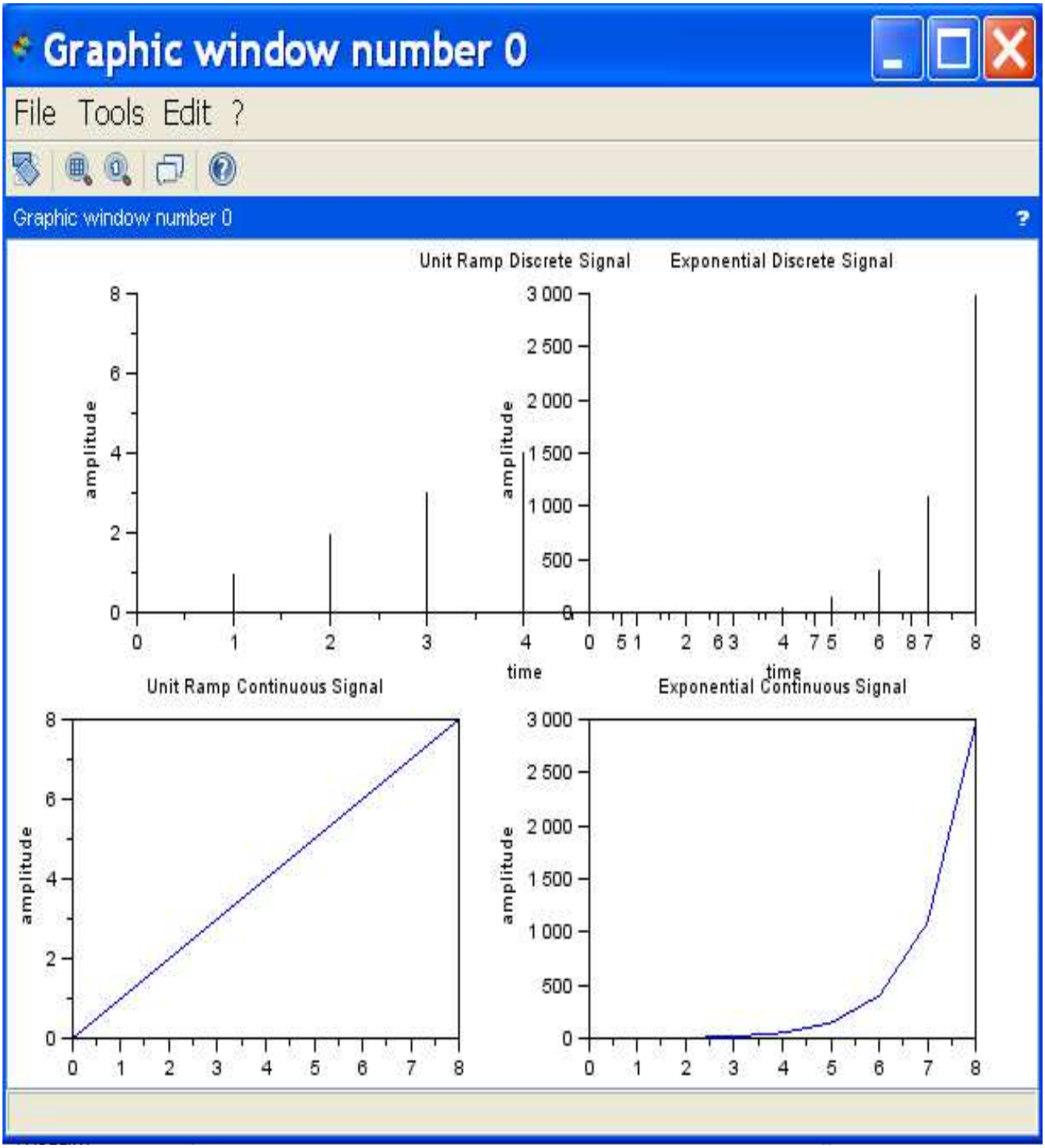
TOOL:- SCILAB /MATLAB

Program:-

```
n1=0:8;
y1=n1;
y2=exp(n1);
subplot(2,1,1);
plot2d3 (n1,y1);
xlabel('time');
ylabel('amplitude');
title('Unit Ramp Discrete Signal');
subplot(2,2,2);
plot2d3 (n1,y2);
xlabel('time');
ylabel('amplitude');
title('Exponential Discrete Signal');
subplot(2,2,3);
plot(n1,y1);
xlabel('time');
ylabel('amplitude');
title('Unit Ramp Continuous Signal');
subplot(2,2,4);
```

```
plot(n1,y2);
xlabel('time');
ylabel('amplitude');
title ('Exponential Continuous Signal');
```

output:


Graphic window number 0
File Tools Edit ?
Graphic window number 0
Unit Ramp Discrete Signal
Exponential Discrete Signal
amplitude
time
Unit Ramp Continuous Signal
Exponential Continuous Signal

Date of Experiment: _____

EXPERIMENT NO.:- 3

Aim:- Write a program for addition and subtraction of two given signal (discrete and continuous domain)

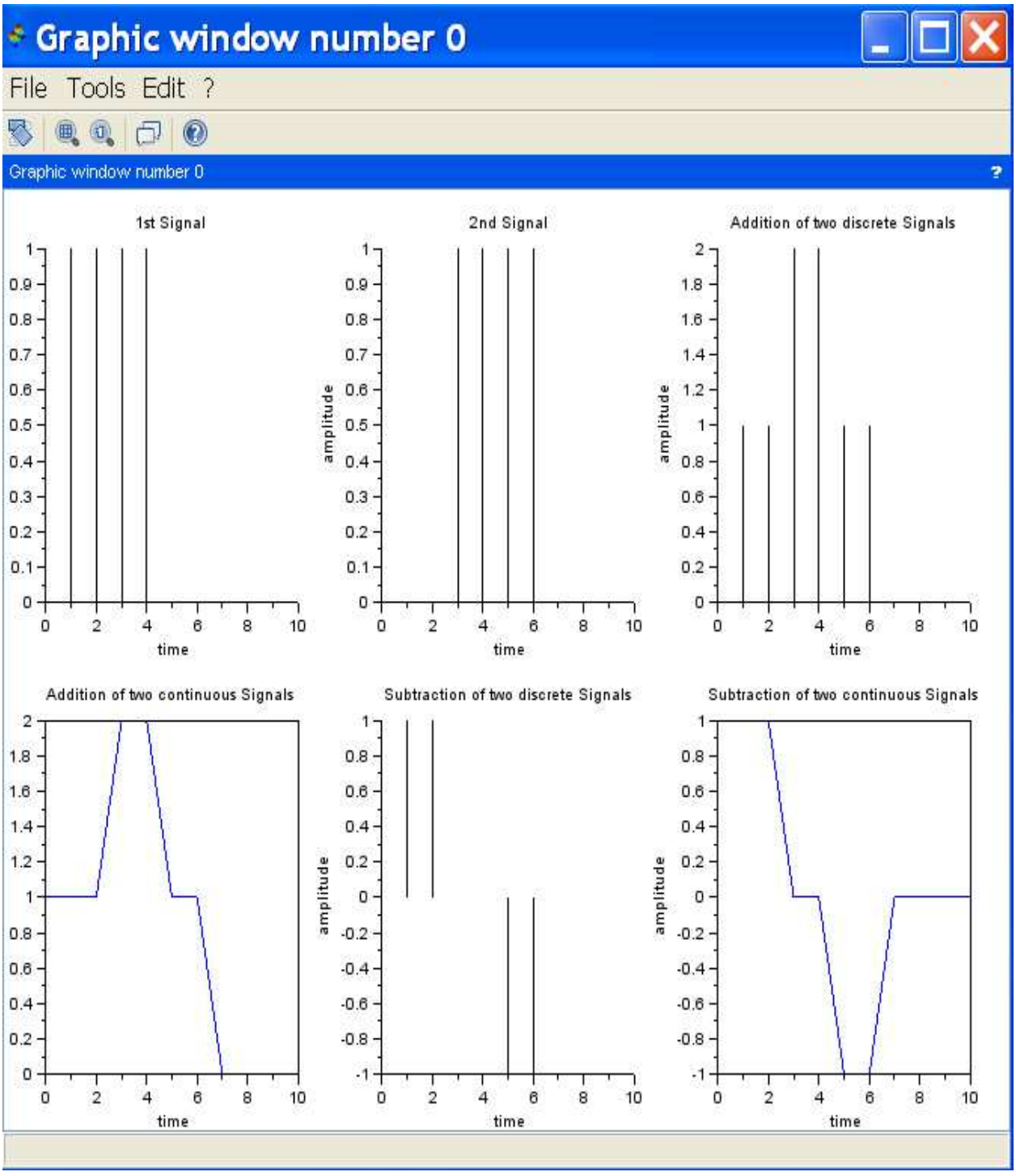
TOOL: - SCILAB /MATLAB

Program:-

```
clc
n1=0:10;
y1=[ones(1,5),zeros(1,6)];
y2=[zeros(1,3),ones(1,4),zeros(1,4)];
y3=y1+y2;
y4=y1-y2;
subplot(2,3,1);
plot2d3 (n1,y1);
xlabel('time');
ylabel('amplitude');
title('1st Signal');
subplot(2,3,2);
plot2d3 (n1,y2);
xlabel('time');
ylabel('amplitude');
title('2nd Signal');
subplot(2,3,3);
```

```
plot2d3(n1,y3);
xlabel('time');
ylabel('amplitude');
title('Addition of two discrete Signals');
subplot(2,3,4);
plot(n1,y3);
xlabel('time');
ylabel('amplitude');
title('Addition of two continuous Signals');
subplot(2,3,5);
plot2d3(n1,y4);
xlabel('time');
ylabel('amplitude');
title('Subtraction of two discrete Signals');
subplot(2,3,6);
plot(n1,y4);
xlabel('time');
ylabel('amplitude');
title('Subtraction of two continuous Signals');
```

output:


Graphic window number 0
File Tools Edit ?
Graphic window number 0
1st Signal
2nd Signal
Addition of two discrete Signals
Addition of two continuous Signals
Subtraction of two discrete Signals
Subtraction of two continuous Signals
amplitude
time

Date of Experiment: _____

EXPERIMENT NO.:- 4

Aim:- Write a program to generate the sample, unit step, ramp and exponential signal.

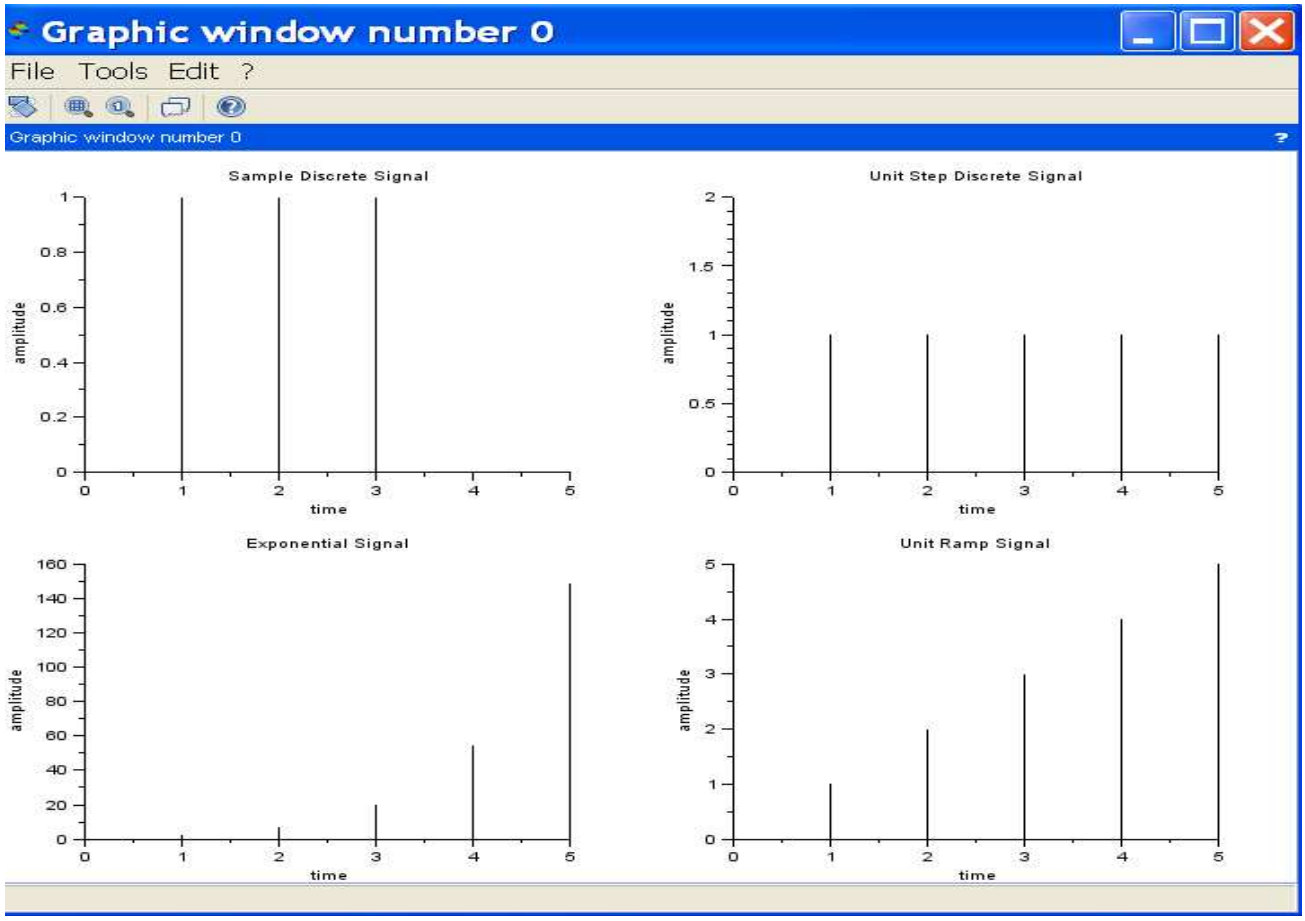
TOOL:- SCILAB 5.4

Program:-

```
clc
n1=0:5;
y1=[ones(1,4),zeros(1,2)];
y2=[ones(1,6)];
y3=exp(n1);
y4=n1;
subplot(2,2,1);
plot2d3 (n1,y1);
xlabel('time');
ylabel('amplitude');
title('Sample Discrete Signal');
subplot(2,2,2);
plot2d3 (n1,y2);
xlabel('time');
ylabel('amplitude');
title('Unit Step Discrete Signal');
subplot(2,2,3);
plot2d3(n1,y3);
xlabel('time');
```

```
ylabel('amplitude');
title('Exponential Signal');
subplot(2,2,4);
plot2d3(n1,y4);
xlabel('time');
ylabel('amplitude');
title('Unit Ramp Signal');
```

output:



Date of Experiment: _____

EXPERIMENT NO.:-5

Aim: - Write a program to generate signal shifting, folding, addition and multiplication.

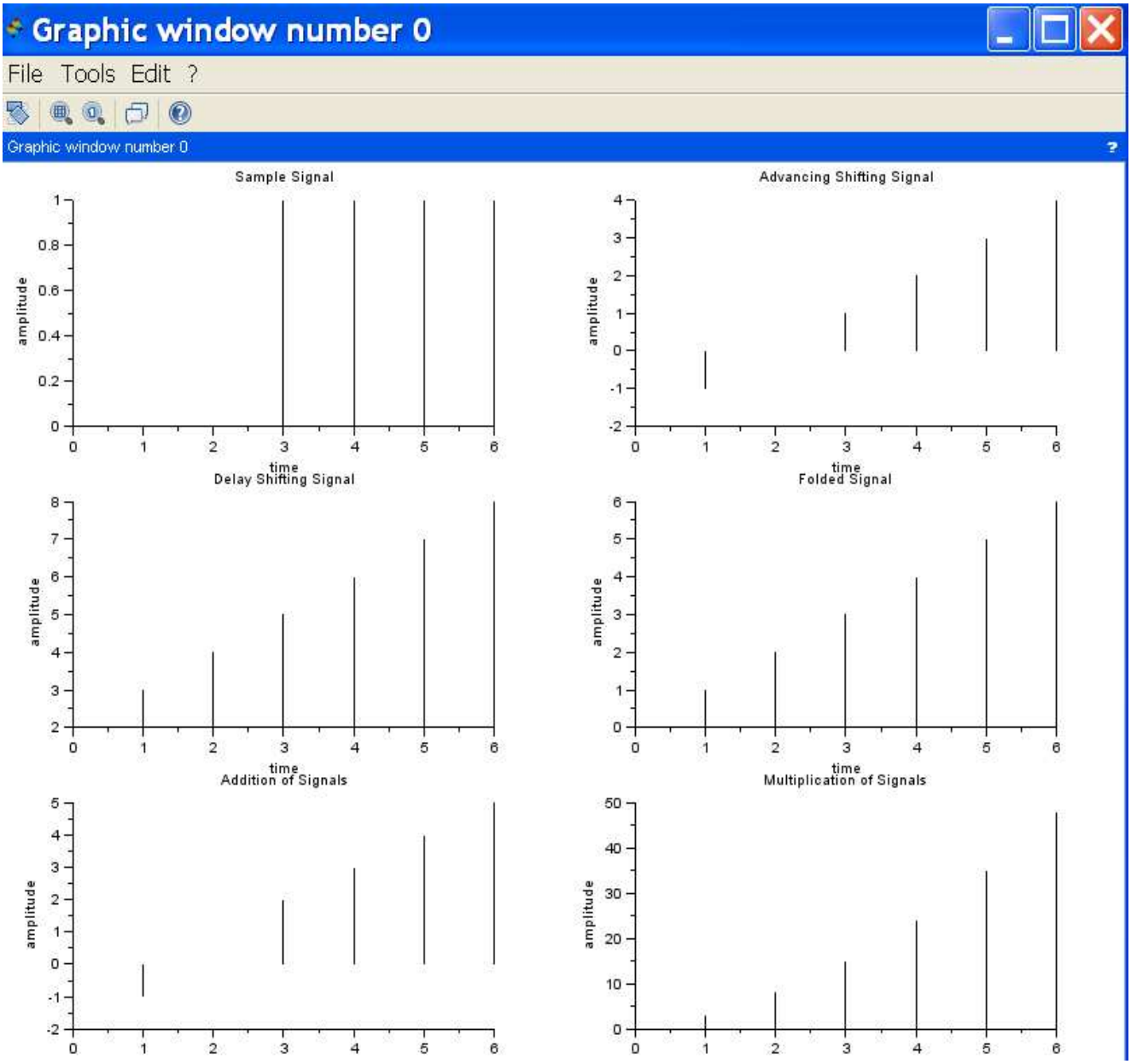
TOOL: - SCILAB 5.4

Program:-

```
clc
n1=0:6;
y1=[zeros(1,3),ones(1,4)];
y2=n1-2;
y3=n1+2;
y4=n1;
y5=y1+y2;
y6=y3.*y4;
subplot(3,2,1);
plot2d3 (n1,y1);
xlabel('time');
ylabel('amplitude');
title('Sample Signal');
subplot(3,2,2);
plot2d3 (n1,y2);
xlabel('time');
ylabel('amplitude');
title('Advancing Shifting Signal');
subplot(3,2,3);
```

```
plot2d3(n1,y3);
xlabel('time');
ylabel('amplitude');
title('Delay Shifting Signal');
subplot(3,2,4);
plot2d3(n1,y4);
xlabel('time');
ylabel('amplitude');
title('Folded Signal');
subplot(3,2,5);
plot2d3(n1,y5);
xlabel('time');
ylabel('amplitude');
title('Addition of Signals');
subplot(3,2,6);
plot2d3(n1,y6);
xlabel('time');
ylabel('amplitude');
title('Multiplication of Signals');
```

output:


Graphic window number 0
File Tools Edit ?
Graphic window number 0
Sample Signal
amplitude
time
Advancing Shifting Signal
amplitude
time
Delay Shifting Signal
amplitude
time
Folded Signal
amplitude
time
Addition of Signals
amplitude
Multiplication of Signals
amplitude

Date of Experiment: _____

EXPERIMENT NO: 6

Aim: - Write a program for Generation of circular convolution without using built in function in Scilab/ MATLAB

```
Clc;

close all
clear all
x=input('Enterx:     ')
h=input('Enterh:     ')
m=length(x);
n=length(h);
X=[x,zeros(1,n)];
H=[h,zeros(1,m)];
for i=1:n+m-1
Y(i)=0;
for j=1:m
if(i-j+1>0)
Y(i)=Y(i)+X(j)*H(i-j+1);
else
end
ende
nd Y
stem(Y);
ylabel('Y[n]');
xlabel('----->n');
title('Convolution of Two Signals without conv function');
```

Date of Experiment: _____

EXPERIMENT NO. 7

Implementation of Decimation-in-time radix-2 FFT algorithm.

AIM: FFT of a sequence using DIT-FFT method

TOOLS REQUIRED:

Scilab /Mat lab

software

Personal

computer

```
% Direct computation of FFT

x=[1 1 0 0];
N=4;
y=fft(x,N);

stem(abs(y));

ylabel
('Amplitude');
xlabel ('N');
title('Magnitude Response');
```

```
%Matlab Program for FFT using DIT algorithm

clc; clear all; close all;
x=input('enter x[n]:');
N=length(x);
levels=nextpow2(N);
xn=[x,zeros(1,(2^levels)-
N)]; x=bitrevorder(xn)
```

```
N=length(xn);
tw=cos(2*pi*(1/N)*(0:N/2-1))-
j*sin(2*pi*(1/N)*(0:N/2-1)); for level=1:levels;
  L=2^level;
  twlvl=tw(1:N/L:N/
  2); for k=0:L:N-L;

    for n=0:L/2-1;
      A=x(n+k+1);
      B=x(n+k+(L/2)+1)*twlvl(n
      +1); x(n+k+1)=A+B;
      x(n+k+(L/2)+1)=A-B;
    end
  end
  x
end
XK
=x
n=0:N-1;

subplot(2,2,1);stem(n,xn);title('x(n)');xlabel('n');ylabel('Amplitude');
subplot(2,2,2);stem(n,real(XK));title('Real part of X(K)');xlabel('n');ylabel('Amplitude');
subplot(2,2,3);stem(n,imag(XK));title('Imag part of X(K)');xlabel('n');ylabel('Amplitude');
```

OUTPUT AND WAVEFORM:

enter x[n]:[1 2 3 4 4 3 2 1]

XK =

20.0000	-5.8284-2.4142i	0	-0.1716-0.4142i	0	-0.1716 +0.4142i
0	-5.8284 +2.4142i				

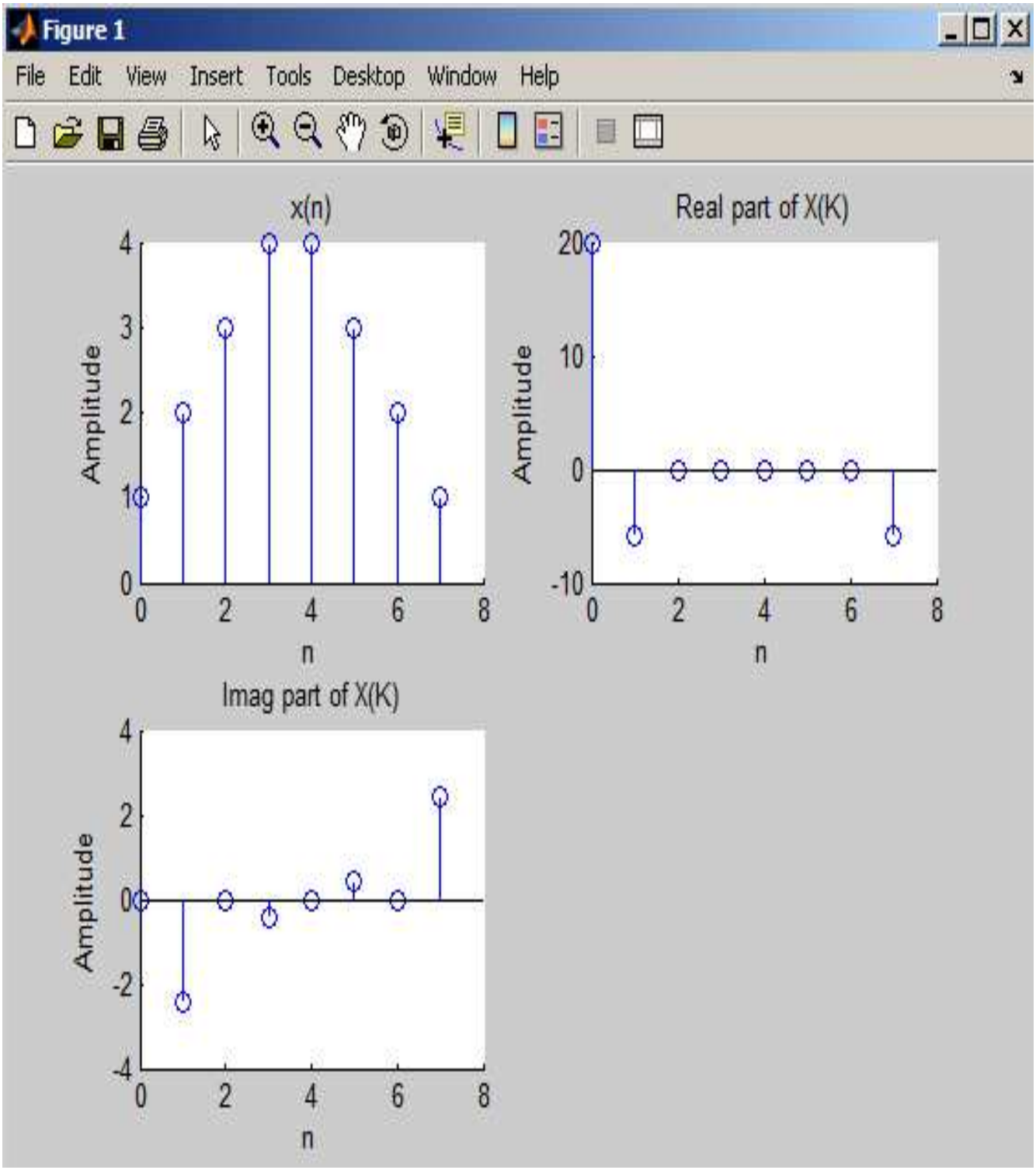


Figure 1
File Edit View Insert Tools Desktop Window Help
x(n)
Amplitude
n
Real part of X(K)
Amplitude
n
Imag part of X(K)
Amplitude
n

EXPERIMENT NO. 8

AIM-Implementation of Linear convolution using DFT (Overlap-add and Overlap-Save methods)

TOOLS REQUIRED:

Scilab /Mat lab

software

Personal

computer

```
a)Over lap add method
clc
clear all
close all
x=[1 2 3 4 5 6 7 8 9 3 5 6 7];
h=[2 2 1];
% x=input('enterx');
% h=input('enterh');
% L=input('enter L')
M=length(h)
lx=length(x)
L=5;
r=rem(lx,L);
x1=[x zeros(1,L-r)];
lx1=length(x1);
nr=length(x1)/L;
h1=[h zeros(1,L-1)];
for k=1:nr
    M1(k,:)=x1(((k-1)*L+1):k*L);
    M2(k,:)=[M1(k,:) zeros(1,M-1)];
    M3(k,:)=ifft(fft(M2(k,:)).*fft(h1));
    M4(k,:)=[zeros(1,(k-1)*L) M3(k,:) zeros(1,(nr-k)*L)];
end
y=sum(M4)


(b) Over lap save method
clc;
clear all;
x=input('Enter 1st sequence X(n)= ');
```

```
h=input('Enter 2nd sequence H(n)= ');
L=input('Enter length of each block L = ');

% Code to plot X(n)
subplot (2,2,1);
stem(x);
stem(x,'blue');
xlabel('n----->');
ylabel('Amplitude------>');
title('X(n)');

%Code to plot H(n)
subplot (2,2,2);
stem(h);
stem(h,'black');
xlabel('n----->');
ylabel('Amplitude------>');
title(' H(n)');

% Code to perform Convolution using Overlap Save Method
M=length(h);
lx=length(x);
r=rem(lx,L);
x1=[x zeros(1,L-r)];
nr=(length(x1))/L;
h1=[h zeros(1,L-1)];
for k=1:nr
    Ma(k,:)=x1(((k-1)*L+1):k*L)
    if k==1
        Ma1(k,:)=[zeros(1,M-1) Ma(k,:)];
    else
        Ma1(k,:)=[Ma(k-1,(L-M+2):L) Ma(k,:)];
    end
     Ma2(k,:)=ifft(fft(Ma1(k,:)).*fft(h1));
end
      Ma3=Ma2(:,M:(L+M-
      1)); y1=Ma3';
      y=y1(:)'

      % Representation of the ConvoledSignal
      subplot(2,2,3:4);
      stem(y,'red
      ');
      xlabel('n ---->');
      ylabel('Amplitude------>');
      title ('ConvolvedSignal');
```

Date of Experiment: _____

EXPERIMENT NO. 9

Aim-Implementation of IIR digital filter using Butterworth method and bilinear transformation

TOOLS REQUIRED:

Scilab /Mat lab

software

Personal

computer

a) To Design a Butterworth High pass filter for the given specifications usingMatlab.

```
%To design a Butterworth Highpass filter for the given
specifications clf;
alphap=input('enter pass attenuation in db=');%passband attenuation in db
alphas=input('enter stopband attenuation in db=');% stopband attenuation in
dbfp=input('enter passband frequency in hz='); % passband frequency
in hz fs=input('enter stopband frequency in hz='); % stopband
frequency in hz F=input('enter sampling frequency in hz='); %
sampling frequency in hzomp=2*fp/F; %frequency in radians
oms=2*fs/F;
%to find cutoff frequency and order of the filter
[n,wn]=buttord(omp,oms,alphap,alphas);
%system function of the filter
[b,a]=butter(n,wn,'high');
```

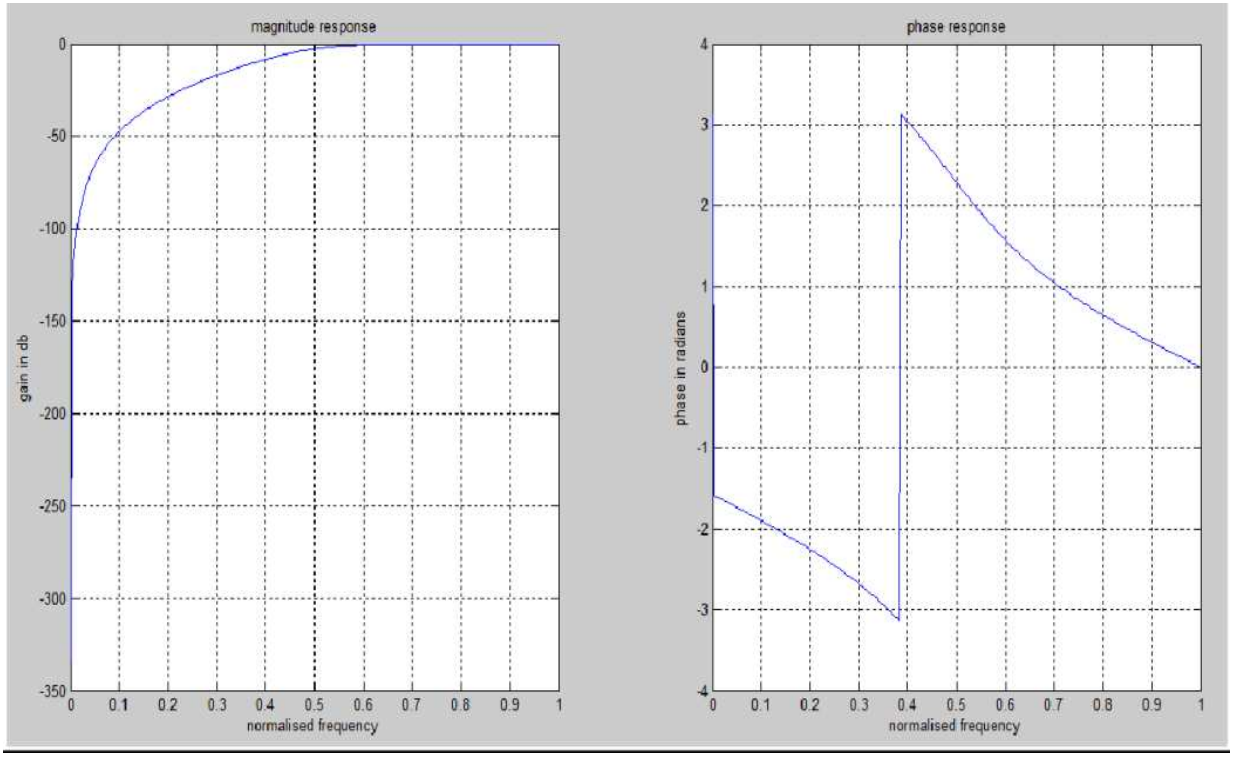
```
w=0:0.01:pi;

[h,om]=freqz(b,a,w,'whole');

m=20*log10(abs(h));

an=angle(h);

subplot(1,2,1;

plot(om/pi,m;

grid;

xlabel('normalised frequency');

ylabel('gain in db');

title('magnitude

response'); subplot(1,2,2);

plot(om/pi,an);

grid;

xlabel('normalised

frequency'); ylabel('phase in

radians'); title('phase

response');  disp(b);

disp(a);
```

INPUT

S:

```
enter pass attenuation in db=.4
enter stopband attenuation in db=30
enter passband frequency in hz=800
enter stopband frequency inhz=400
enter sampling frequency in hz=2000
```

OUTPUT WAVEFORMS



B=0.0265 -0.1058 0.1587 -0.1058 0.0265
A= 1.0000 1.2948 1.0206 0.3575 0.0550

Date of Experiment: _____

EXPERIMENT NO. 10

Aim: - To develop program for computing DFT

TOOLS REQUIRED:

Scilab /Mat lab

software

Personal

computer

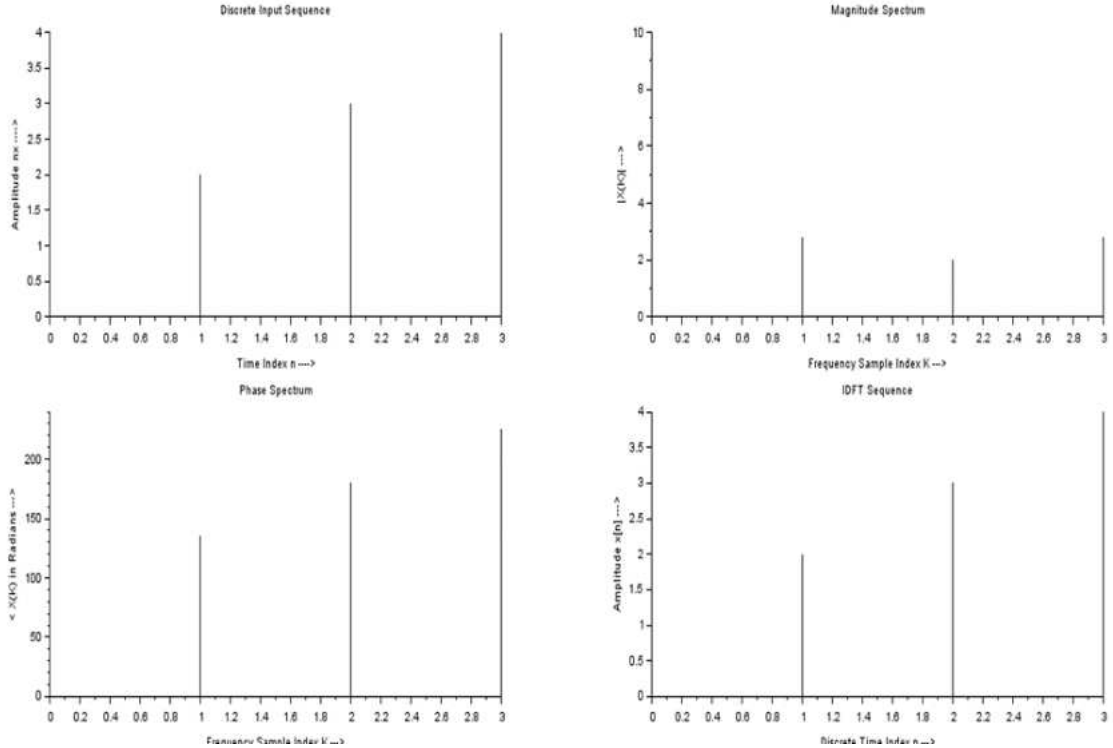
Program:-

```
--> xn = input('Enter the Real Input Discrete sequence x[n] = ');
Enter the Real Input Discrete sequence x[n] = [1,2,3,4]


--> N = length(xn);

--> XK = zeros(1,N);

--> IXK = zeros(1,N);

--> for k = 0:N-1
> for n = 0:N-1
> XK(k+1) = XK(k+1)+xn(n+1)*exp(-%i*2*%pi*k*n/N);
> end
> end

--> [phase, db] = phasemag(XK)
phase  =

  0.   135.   180.   225.
db  =

  20.   9.0308999   6.0205999   9.0308999

-->disp(XK,'Discrete Fourier Transform X(k) = ');

  10. + 0.i  -2. + 2.i  -2. - 9.797D-16i  -2. - 2.i

 "Discrete Fourier Transform X(k) = "
```

```
--> disp(abs(XK),'Magnitude Spectral Samples =');

   10.   2.8284271   2.   2.8284271

  "Magnitude Spectral Samples ="

-->disp(phase,'Phase Spectral Samples = ');

   0.   135.   180.   225.

  "Phase Spectral Samples = "

--> n = 0:N-1;

--> K = 0:N-1;

-->subplot(2,2,1);

--> a = gca();

--> a.x_location = "origin";

--> a.y_location = "origin";

--> plot2d3('gnn',n,xn);

-->xlabel("Time Index n ----> ");

-->ylabel("Amplitude nx ----> ");

-->title("Discrete Input Sequence");

-->subplot(2,2,2);

--> a = gca();

--> a.x_location = "origin";

--> a.y_location = "origin";

--> plot2d3('gnn',K,abs(XK));

-->xlabel("Frequency Sample Index K ---> ");

--> ylabel("|X(K)| ---> ");

-->title("Magnitude Spectrum");
```

```
-->subplot(2,2,3);

--> a = gca( );

--> a.x_location = "origin";

--> a.y_location = "origin";

--> plot2d3('gnn',K,phase);

-->xlabel("Frequency Sample Index K ---> ");

-->ylabel(" < X(K) in Radians ---> ");

-->title("Phase Spectrum");

-->

--> // Code Block to find the IDFT of the Sequence

-->

--> for n = 0:N-1
> for K = 0:N-1
> IXK(n+1) = IXK(n+1)+XK(K+1)*exp(%i*2*%pi*K*n/N);
> end
> end

--> IXK = IXK/N;

--> ixn = real(IXK);

-->subplot(2,2,4);

--> a = gca();

--> a.x_location = "origin";

--> a.y_location = "origin";

--> plot2d3('gnn',[0:N-1],ixn)

-->xlabel("Discrete Time Index n ---> ");

-->ylabel(" Amplitude x[n] ---> ");

-->title("IDFT Sequence");
```

Output :


Discrete Input Sequence
Amplitude nx --->
Time Index n --->
Magnitude Spectrum
|X(K)| --->
Frequency Sample Index K --->
Phase Spectrum
< X(K) in Radians --->
IDFT Sequence
Amplitude x[n] --->
Discrete Time Index n -->