BASIC SIMULATION LAB
(II/IV B.Tech- I SEMESTER)

<u>LAB MANUAL</u>
AY2020-2021

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Chaitanya Bharathi P.O, Gandipet, Hyderabad – 500075
Department of E.C.E

LIST OF EXPERIMENTS

1. Basic operations on matrices.
2. Generation on various signals and Sequences (periodic and aperiodic), such as unit lmpulse unit step, square, sawtooth, triangular, sinusoidal, ramp, sinc.
3. Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signal/sequence and real and imaginary part of signal.
5. Convolution between signals and sequences.
6. Auto correlation and cross correlation between signals and sequences.
7. Verification of linearity and time invariance properties of a given continuous /discrete system.
8. Computation of unit sample, unit step and sinusoidal response of the given LTI system and verifying its physical Realizability and stability properties.
9. Gibbs phenomenon.
10. Finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using Laplace transform.
12. Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
13. Generation of Gaussian Noise (real and complex),computation of its mean, M.S. Value and its skew, kurtosis, and PSD, probability distribution function.
14. Sampling theorem verification.
15. Removal of noise by auto correlation/cross correlation.
16. Extraction of periodic signal masked by noise using correlation.
17. Verification of Weiner-Khinchine relations.
18. Checking a random process for stationary in wide sense.

Use the Classmate plain record.
NOTE:Start with right side page of the record

% EXP.NO: 1 **Date:15.02.2021**

% Name of the Experiment: BASIC OPERATIONS ON MATRICES

% AIM: To generate matrix and perform basic operations on matrices using MATLAB Software.

% EQUIPMENTS:
% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
clear all;
close all;
a= [1,2,3;3,5,7;7,5,9]; %Generation of matrix
b=a'; %transpose
c=a+b; %matrix addition
d=a-b;
e=a*b; %normal matrix multiplication
f=a.*b; %element by element multiplication
g=inv(a);
h=a*g;
i=eye(5);
j=fliplr(a);
k=det(a);
l=diag(a);
m=magic(3);
n=rand(2,3);
p=randn(3,2);
q=[a b]; %horizontal concatenation of two matrices
r=[a;b]; %vertical concatenation of two matrices
s=size(q);
t=sum(a);
u=sum(sum(a));
v=zeros(2,4);
w=ones(1,5);
```

Write the result statement immediately after the code in RHS only

RESULT:
Some basic operations on matrices are verified using MATLAB;

All the matrix calculations/graphs must be in the LHS

Answer the Viva Questions both left and right side of record after the result

VIVA QUESTIONS:
1.What is MATLAB?
2.Write any five applications of MATLAB?
3.What is the difference between * and .* operators?
4.What is the default variable type in MATLAB?
5.What is function of command ‘close all’?
6.What is the function of command window?
7.Which command is used to clear the command window screen?
8.What happens when a MATLAB command is executed without a semicolon?
9.How do you create a M-file?
10.What is the function of workspace in MATLAB?

Start the next Exp. From RHS side page with the above format.

2. Generation of Various Signals

% EXP.NO: 2 **Date: .02.2021**

% Name of the Experiment: **Generation of Various Signals**

% AIM: To Generate various signals and Sequences (periodic and aperiodic), such as unit impulse, unit step, square, sawtooth, triangular, sinusoidal, ramp, sinc using MATLAB

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
close all;
clear all;
 % Generation of Continuous Time Sinusoidal Signal
t=0:0.01:0.6;
p=sin(2*pi*5*t);
subplot(2,2,1);
plot(t,p);
grid;
axis([0,0.6,-1.5,1.5]);
xlabel('time');
ylabel('amplitude');
title('sinusoidal wave');

 % Generation of Continuous Time Square Signal

q=square(2*pi*5*t);
subplot(2,2,2);
plot(t,q);
grid;
axis([0,0.6,-1.5,1.5]);
xlabel('time');
ylabel('amplitude');
title('square wave');
```

```
% Generation of Continuous Time Sawtooth Signal

r=sawtooth(2*pi*5*t);
subplot(2,2,3);
plot(t,r);
grid;
axis([0,0.6,-1.5,1.5]);
xlabel('time');
ylabel('amplitude');
title('sawtooth wave');

% Generation of Continuous Time Triangular Signal
s=sawtooth(2*pi*5*t,0.5);
subplot(2,2,4);
plot(t,s);
grid;
axis([0,0.6,-1.5,1.5]);
xlabel('time');
ylabel('amplitude');
title('triangular wave');

% Generation of Continuous Time ramp Signal

n=0:10;
x=n;figure(2);
subplot(2,2,1),plot(n,x);grid on;
xlabel('n'),ylabel('x(n)');
title('ramp sequence');

% Generation of Continuous Time unit step Signal

y=[ones(1,11)];
subplot(2,2,2),plot(n,y);grid on;
xlabel('n'),ylabel('y(n)');
title('unit step  sequence');
```

```
% Generation of Continuous Time unit impulse Signal

n1=-5:5;
z=[zeros(1,5),ones(1,1),zeros(1,5)];
subplot(2,2,3),plot(n1,z);grid on;
xlabel('n'),ylabel('z(n)');
title('unit impulse sequence');
% Generation of Continuous Time exponential Signal

n2=0:0.05:5;
w=exp(-2*n2);
subplot(2,2,4),plot(n2,w);grid on;
xlabel('n'),ylabel('w(n)');
title('Exponential  sequence');

% Generation of Discrete Time unit impulse Sequence

clc;
close all;
clear all;
t1=-5:1:5;
y1=[zeros(1,5),ones(1,1),zeros(1,5)];
subplot(2,2,1);
stem(t1,y1);
grid;
xlabel('t.....>');
ylabel('amplitude');
title('unit impulse sequence');


% Generation of Discrete Time unit step Sequence

disp('unit step sequence');
n1=input('enter length of unit step');
t2=0:1:n1-1;
y2=ones(1,n1);
subplot(2,2,2);
stem(t2,y2);
grid;
xlabel('t');
ylabel('amplitude');
title('unit step sequence');
```

```
% Generation of Discrete Time ramp Sequence

disp('unit ramp sequence');
n2=input('enter the length of unit ramp');
t3=0:1:n2-1;
y3=t3;
subplot(2,2,3);
stem(t3,y3);
grid;
xlabel('t');
ylabel('amplitude');
title('unit ramp sequence');

% Generation of Discrete Time unit exponential Sequence

disp('unit exponential sequence');
n3=input('enter the length of unit exponential sequence');
a=input('enter the value of a');
t4=0:1:n3-1;
y4=exp(-a*t4);
subplot(2,2,4);
stem(t4,y4);
grid;
xlabel('t');
ylabel('amplitude');
title('unit exponential sequence');
```

RESULT: Continuous signals and discrete time signals are generated.

VIVA QUESTIONS:

1.Define Continuous signals?
2.Define Discrete signals?
3.Distinguish between periodic and non-periodic signals?
4.Write the equation of a sinusoidal signal?
5.Define ramp sequence?
6.What is the difference between plot and stem commands?
7.Define an exponential sequence?
8.What is the function of subplot command?
9.Is the sum of two periodic signals always periodic?
10.write the expressions for basic signals generated in above program

3. Basic Operations on Signals

% EXP.NO: 3 **Date:**

% Name of the Experiment: **Basic Operations on Signals**

% AIM: To perform the operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and power.

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

% Generation of sinusoidal signal

```
t=-2*pi:0.001:2*pi;
x=sin(2*pi*.5*t);
subplot(3,2,1),plot(t,x);
axis([-7,7,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('original sinusoidal');
grid on;
a=t+2*pi;
%Time Delay
%a=-t;
subplot(3,2,3),plot(a,x);
axis([-7,7,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('Time delayed sinusoidal');grid on;

b=t-(2*pi);
subplot(3,2,5),plot(b,x);
axis([-7,7,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('Advanced sinusoidal');grid on;
c=2*t; e=-t;
subplot(3,2,2),plot(e,x);
axis([-7,7,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('time reversed sinusoidal'); grid on;
subplot(3,2,4),plot(c,x);
axis([-12.5,12.5,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('time expansion');grid on;
d=t/2;
subplot(3,2,6),plot(d,x);
```

```
axis([-3.5,3.5,-1.5 1.5]);
xlabel('time......>'),ylabel('sin(t)'),title('time compresion');grid on;

 % Addition, Subtraction, Multiplication
clc;
close all;
clear all;

t=-3:0.01:3;
x1=(1.0).*(t>=0&t<=2);
x2=(1.0).*(t>=0.5&t<=1.5);
y1=x1+x2;
y2=x1-x2;
y3=x1.*x2;

subplot(3,2,1);
plot(t,x1);
axis([-3 3 0 3]);
xlabel('t');
ylabel('x1(t)');
title('signal x1');
grid;

subplot(3,2,3);
plot(t,x2);
axis([-3 3 0 3]);
xlabel('t');
ylabel('x2(t)');
title('signal x2');
grid;

subplot(3,2,2);
plot(t,y1);
axis([-3 3 0 3]);
xlabel('t');
ylabel('y1(t)');
title('addition of x1 and x2');
grid;

subplot(3,2,4);
plot(t,y2);
axis([-3 3 0 3]);
xlabel('t');
ylabel('y2(x)');
title('subtraction of x1 and x2');
```

```
grid;

subplot(3,2,6);
plot(t,y3);
axis([-3 3 0 3]);
xlabel('t');
ylabel('y3(x)');
title('multiplication of x1 and x2');
grid:

% Energy and Power of the Discrete Time  Sequence
clc
clear all
close all
n=-5:5;
x=((-0.5).^n);
y=abs(x)
energy=sum(y.^2)
power=(sum(y.^2))/length(n)
```

RESULT: Various operations on continuous signals are performed and calculated energy and power of the signal

VIVA QUESTIONS:

1.Define Energy signal?

2.Define Power signal?

3.Which MATLAB operator is used to multiply two signals?

4.What do you mean by scaling of a signal? Where do you find the need for scaling?

5.Which MATLAB function is used to fold a signal?

6.Which MATLAB command divides figure window into four parts?

% EXP.NO: 4 **Date:**

4.Finding the Even and Odd parts of Signal

% Name of the Experiment: **Even and Odd parts of Signal**

% AIM: To generate matrix and perform basic operations on matrices using MATLAB Software.

% EQUIPMENTS:
% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
clear all;
close all;
t=-20:0.01:20;
u=0.5*sign(t)+0.5;
x1=exp(-1.5*t).*u;
subplot(221),plot(t,x1);
x2=fliplr(x1);
subplot(223),plot(t,x2);
xe=0.5*(x1+x2);
subplot(222),plot(t,xe);
xo=0.5*(x1-x2);
subplot(224),plot(t,xo);
figure;
%Unit Step
n=-15:1:15;
y1=[zeros(1,15),ones(1,10),zeros(1,6)];
y2=fliplr(y1);
ye=0.5*(y1+y2);
yo=0.5*(y1-y2);
```

```
subplot(221),stem(n,y1);grid on
subplot(223),stem(n,y2);
subplot(222),stem(n,ye);

subplot(224),stem(n,yo);
%triangular
figure;
t=-1:.05:1
u=0.5*sign(t)+0.5;
x=(1-t).*u;
y=fliplr(x)
xe=0.5*(x+y);
xo=0.5*(x-y);
subplot(221),stem(t,x);grid on
subplot(223),stem(t,y);grid on
subplot(222),stem(t,xe);grid on
subplot(224),stem(t,xo);grid on
```

RESULT: Even and odd part of real signals and complex signals are found.

VIVA QUESTIONS:

1.Define even and odd signal

2 .How to get even part from any signal?

3. How to get odd part from any signal

% EXP.NO: 5 **Date:**

5.Convolution of Signals and Sequences

% Name of the Experiment: **Convolution of Signals and Sequences.**

% AIM: To perform convolution between signals and sequences using MATLAB Software.

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
clear all;
close all;
x1=input('Enter the first sequence x1(n) = ');
t1=input('Enter the starting time of first sequence t1 = ');
x2=input('Enter the second sequence x2(n) = ');
t2=input('Enter the starting time of second sequence t2 = ');

l1=length(x1);
a=t1+l1-1;
n1=t1:a;
subplot(311);
stem(n1,x1);
xlabel('time--->');
ylabel('amplitude--->');
title('First sequence');


l2=length(x2);
b=t2+l2-1;
n2=t2:b;
subplot(312);
stem(n2,x2);
xlabel('time--->');
ylabel('amplitude--->');
title('Second sequence');
```

```
y=conv(x1,x2);
t=t1+t2;
c=a+b;
n=t:c;
subplot(313);
stem(n,y);

xlabel('time--->');
ylabel('amplitude--->');
title('Convolved output');

%%Method 2

n1=0:1:3;
%x=[1 2 3 4];
%n1=length(x);
x=input('enter the first sequence');
subplot(2,2,1),stem(n1,x); grid on;
n2=0:1:3;
%y=[2 1 2 1];
%n2=length(y);
y=input('enter the second sequence');
subplot(2,2,2),stem(n2,y);grid on;
z=conv(x,y);
 n=length(z);
t=0:1:n-1;
%n=length(x)+length(y)-1;
subplot(2,2,3), stem(t,z);grid on;
disp('the convolution of x and y is= ')
disp(z);
%% Convolution of Continuous time Signals
clc;
close all;
clear all;

t=0:0.1:3;
x1=t/3.*(t>=0&t<=3);
t1=-1:0.1:1;
x2=(1.*(t1>=-1&t1<=1));
x3=conv(x1,x2);
```

```
subplot(3,1,1);
stem(t,x1);
xlabel('t');
ylabel('x1');
title('first signal');
subplot(3,1,2);
stem(t1,x2);
xlabel('t');
ylabel('x2');
title('second signal');
n3=length(x3);
subplot(3,1,3);

stem(x3)
xlabel('t1');
ylabel('x3');
title('convolved signal');
```

Result: Obtained the convolution of two signals and sequences using matlab .

VIVA QUESTIONS:

1.Write the mathematical equation for convolution in time domain and convolution in frequency domain?

2.Write the mathematical equation for discrete convolution?

3.What is meant by impulse response?

4. Which inbuilt function is used to perform the convolution in MATLAB?

5. What are the steps involved in performing the convolution?

6. What are the applications of convolution?

7. Define Linear and time invariant system.

% EXP.NO: 6 **Date: -- .02.2021**

6.Correlation of Signals and Sequences

% Name of the Experiment: **Correlation of two signals and sequences**

% AIM: To perform correlation between signals and sequences using MATLAB Software.

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
% Correlation of two signals
clc
clear all
close all

t=-2*pi:0.01:2*pi;
x1=3*sin(2*pi*1.5*t);
y=xcorr(x1,x1);
subplot(2,1,1),plot(y);
xlabel('t'),ylabel('y(t)'),title('Auto-Correlation of x1');

t1=0:0.05:7;
x2=2*sin(2*pi*0.5*t);
y1=xcorr(x1,x2);
subplot(2,1,2),plot(y1);
xlabel('t'),ylabel('y(t)'),title('Cross-Correlation of x1 and x2');


% Correlation of two discrete time sequences

clc;
close all;
clear all;

t=0:1:3;
x1=[1 2 3 4];
x2=[2 1 2 1];

[r,lag]=xcorr(x1,x2);
subplot(3,1,1);
stem(t,x1);
xlabel('t'),ylabel('x1'),title('first signal');
```

```
subplot(3,1,2);
stem(t,x2);
xlabel('t');
ylabel('x2');
title('second signal');

n3=length(r);
n=0:1:n3-1
subplot(3,1,3);
stem(n,r);
xlabel('n');
ylabel('r(n)');
title('cross correlated signal');
```

Result: Obtained the Auto-Correlation and Cross correlation of two signals and sequences using matlab .

VIVA:

1. Write the mathematical equation for correlation?
2. What is the difference between cross correlation and autocorrelation?
3. What are the applications of correlation?
4. Write the relation between correlation and convolution?
5. What is the Fourier transform of autocorrelation function?
6. Write any two properties of auto-correlation

% EXP.NO: 7 **Date:**

7.Linearity and Time-Invariance

% Name of the Experiment: **Linearity and Time-Invariance**

% AIM: To check the linearity and Time-Invariance of the given continuous system using MATLAB Software.

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
%% Linearity%
clc;
close all;
clear all;
%y(t)=x(t)cos(2*pi*100*t);
%x(t)=0.4cos(2*pi*10*t);
t=-0.1:0.001:0.1;
x=0.4.*cos(2*pi*10*t);
y=x.*cos(1*pi*100*t);
x1=0.2*cos(2*pi*5*t);
x2=0.6*cos(2*pi*8*t);
a1=2;
a2=3;
y1=x1.*cos(2*pi*100*t);
y2=x2.*cos(2*pi*100*t);
y3=a1*y1+a2*y2;
x3=a1*x1+a2*x2;
y4=x3.*cos(2*pi*100*t);
if(round(y3)==round(y4));
   disp('linear');
else;
   disp('non linear');
end;
figure();
subplot(2,1,1);
plot(t,y3);
grid;
xlabel('t');
ylabel('y3');
subplot(2,1,2);
plot(t,y4);
```

```
grid;
xlabel('t');
ylabel('y4');

% time invariance of a given system y(t)=t.cosx(t)

clc;
close all;
clear all;
t=-1:0.01:1;
x=(2*t)+3*t.^2;
k=2;
xtmk=(2*(t-k))+3*(t-k).^2;
ytck=t.*cos(xtmk);%response to delayed input
ytmk=(t-k).*cos(xtmk);%delayed response
if(round(ytck)==round(ytmk))
   disp('time invariant');
else
   disp('time variant');
end
figure;
subplot(2,1,1);
plot(t,ytck);
xlabel('t');
ylabel('y(t,k)');
title('response to delayed input');
subplot(2,1,2);
plot(t,ytmk);
xlabel('t');
ylabel('y(t-k)');
title('delayed response');
```

Result: Verified the linearity and time invariance of a continuous time system

VIVA QUESTIONS:

1. Express mathematically the principle of superposition theorem.

2.Define an LTI system?

3.Give an example of Continues time and discrete time linear system.

4. Give an example of Continues time and discrete time time invariant system.

5. Give an example of Continues time and discrete time time variant system.

6. Give an example of Continues time and discrete time non- linear system.

% EXP.NO: 8 **Date:**

8.LTI System Response

% Name of the Experiment: **LTI System Response**

% AIM: To find the unit impulse and step response of an LTI system using MATLAB Software.

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
clear all;
close all;
% numerator=[1 -2 1];
% denominator=[1 6 11 6];
numerator=[1 0.65 0.8 -0.55];
denominator=1;
N=10;
n=0:N;
imp=[1 zeros(1,N)];
h=filter(numerator, denominator, imp);
disp('imulse response of LTI system is');
disp(h);
figure;
stem(n,h)
title('impulse response of LTI system');

% unit step response of LTI system
numerator=[1 -2.4 2.88];
denominator=[1 -0.8 0.64];
N=10;
n=0:1:N-1;
u=ones(1,N);
s=filter(numerator, denominator, u);
disp('step response of LTI system is');
disp(s);
figure;
stem(n,s)
title('step response of LTI system');
```

Result: The response of LTI system for unit impulse and unit step as the inputs is verified.

VIVA QUESTIONS

1. Define impulse and step response of LTI system
2. Define the transfer function and give the expression of it in .
3. What is the relationship between input and output of an LTI system?
4. Write the syntax of the built-in function used to obtain the LTI system response.
5. Write the syntax of “impz” built-in function.

% EXP.NO: 9 **Date:**

9.Gibb’s Phenomenon

% Name of the Experiment: **Gibb’s Phenomenon**

% AIM: To verify the Gibb’s Phenomenon

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
close all;
clear all;
N=input('type total number of harmonics');
t=0:0.001:1;
y=square(2*pi*t);
plot(t,y,'r','linewidth',2);
axis([0 1 -1.5 1.5]);
hold;
sq=zeros(size(t));
for n=1:2:N
sq=sq+4/(pi*n)*sin(2*pi*n*t);
end;
plot(t,sq);
grid;
xlabel('t');
ylabel('sq(t)');
title('synthesized square wave');

%%Method 2

clc;
clear all;
close all;
t=0:0.0005:2*pi;
x1=(4/(pi))*sin(t);
x2=(4/(3*pi))*sin(3*t);
x3=(4/(5*pi))*sin(5*t);
x4=(4/(7*pi))*sin(7*t);
```

```
subplot(2,2,1), plot(x1),xlabel('time'),ylabel('f(t)'),grid on;
subplot(2,2,2), plot(x1+x2),xlabel('time'),ylabel('f(t)'),grid on;
subplot(2,2,3), plot(x1+x2+x3),xlabel('time'),ylabel('f(t)'),grid on;
subplot(2,2,4), plot(x1+x2+x3+x4),xlabel('time'),ylabel('f(t)'),grid on;
xlabel('time'),ylabel('f(t)'),title('Approximation of Rect using Sine');
grid on
```

Result: Verified the gibb’s phenomenon using matlab

Viva

1. Define Gibbs phenomenon
2. What are harmonics?
3. Define fundamental frequency
4. Define Fourier series?

% EXP.NO: 10 **Date:**

10.Fourier Transforms

% Name of the Experiment: Fourier Transform

% AIM: To Find the fourier transform of a given signal and plot the magnitude plot and phase plot using matlab

% EQUIPMENTS:

% PC with MATLAB software

% MATLAB Code: (Always write the code in the RHS of the record)

```
% Fourier Transform of a function f(t) = exp(-2*t)u(t)
clc;
clear all;
close all;
syms t w;

f = exp(-2*t).*heaviside(t);
F = fourier(f)
magF = abs(F);                % absolute value
angleF = atan(imag(F)/real(F));%atan is inverse of tan

%Plotting the function f(t) = exp(-2*t)u(t)
subplot(3,1,1);
ezplot(f);         %plot of a function from -2pi to +2pi
title('input signal');
xlabel('t');
ylabel('x(t)');
% magnitude spectrum
subplot(3,1,2);
ezplot(magF);
title(' Magnitude Spectrum');
xlabel('w');
ylabel('|F(w)|');
% Phase spectrum
subplot(3,1,3);
ezplot(angleF);
title(' Phase Spectrum');
xlabel('w');
```

```
ylabel('PHI(w)');
```

```
%% method2
clc;
clear all;
close all;
syms t

a = exp(-2*t).*heaviside(t);
b= t.*exp(-2*t).*heaviside(t);
c=dirac(t);
d=heaviside(t);


A=fourier(a)
B=fourier(b)
C=fourier(c)
D=fourier(d)
```

Using FFT

```
clc;
clear all;
close all;
t=-5:0.01:5
f=cos(2*pi*5*t);
F=fft(f);

magF=abs(F);
angleF=phase(F);
IFT=ifft(F);

subplot(2,2,1);
plot(t,f);
title('input signal')
```

```
axis([-1 1 -2 2]);
grid;

subplot(2,2,2);
plot(t,magF);
title('Magnitude Spectrum')
grid;

subplot(2,2,3);
plot(t,angleF);
title('Phase Spectrum')
axis([-7 7 -5 5]);
grid;

subplot(2,2,4);
plot(t,IFT);
title('Inverse Fourier Transform')
grid;
axis([-1 1 -2 2]);
```

Result: Obtained the fourier transforms of the basic signals and verified with the theoretical results

VIVA QUESTIONS

1. Distinguish between Fourier series and Fourier transform
2. Write the continuous time Fourier transform equation.
3. Write the inverse fourier transform of a continuous time signal.
4. Write the time shifting property of fourier tranform?
5. Define fourier spectrum?
6. Write the time differentiation property of fourier transform?
7. Write any two dirichlet's conditions?
8. Write the fourier transform of impulse function?
9. Draw the spectrum of $\cos w_0 t$?

% EXP.NO: 11 **Date:**

11.Pole-Zero Plot

% Name of the Experiment: Pole-Zero Plot

% AIM: To Locate the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function using MATLAB Software.

% EQUIPMENTS:
% PC with MATLAB software
% MATLAB Code: (Always write the code in the RHS of the record)

```
clc;
clear all;
close all;
numerator=[1 -2.1 0.2];
denominator=[1 -0.25 -0.125 0];
% numerator=[1 1 0];
% denominator=[1 -3 2];
% numerator=input('Enter numerator')
% denominator=input('Enter denominator')
H=tf(numerator, denominator);
[p,z]=pzmap(H);

disp('Zeros are at')
disp(z);
disp('Poles are at')
disp(p);
figure;
%pzmap(H);
zplane(z,p)

if max(real(p))>1
    disp('Poles are not inside of unit circle, system is unstable')
 else
disp('Poles are inside of unit circle, system is stable')
 end
```

using Laplace Transforms:

```
%Plotting the pole zero map in s-plane and checking the stability of system
clc;
clear all;
close all;
```

```
syms s
num=[1 -2 1];
den=[1 6 11 6];
disp('zeros of the given LT are')
zeros=roots(num)
disp('poles of the given LT are')
poles=roots(den)
H=tf(num,den);
[p,z]=pzmap(H);
disp('The taken LT is')
H=tf(num,den)
pzmap(H)

figure;
t=0:0.1:10;
h=impulse(H,t);
plot(t,h);
disp(h);
xlabel('t');
ylabel('h');
title('impulse response');

%Checking stability of system
[r,p,k]=residue(num,den);
disp('pfe coefficient');
disp(r);
if max(real(p))>=0
disp('poles are not in LHS,so the system is unstable');
else
disp('poles are in LHS, so the system is stable');
end
```

Result: Verified the pole-zero plot of a given transfer function of both laplace transforms and z-transforms.

VIVA QUESTIONS:

1.How do you check the stability of linear time invariant system?
2.Define the poles and zeros of a transfer function?
3.Which MATLAB command plots the impulse response of a continuous system?
4.Which MATLAB command displays the transfer function of continuous system?
5.Which MATLAB command displays only poles on the screen?
6.What do you understand by BIBO stability?