Tribhuvan University

Institute of Engineering

Pulchowk Campus

Lab Report on :

LTI SYSTEM

Submitted By:

Saugat Kafley (075BCT099)

Submitted To:

Ganesh Gautam

Department of Electronics and Computer Engineering

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DSAP Lab4 LTI systems

a) Transfer function to z-plane
num = [1 0.23 0.65 1.37 1];
den = [1 0 -1 0.77 1.65];

Code:

```
pkg load signal;
clc;
num = [1 0.23 0.65 1.37 1];
den = [1 0 -1 0.77 1.65];

%freqz(num , den)
[zeros , poles, k] = tf2zp(num , den)
zplane(zeros , poles)
```

Output:

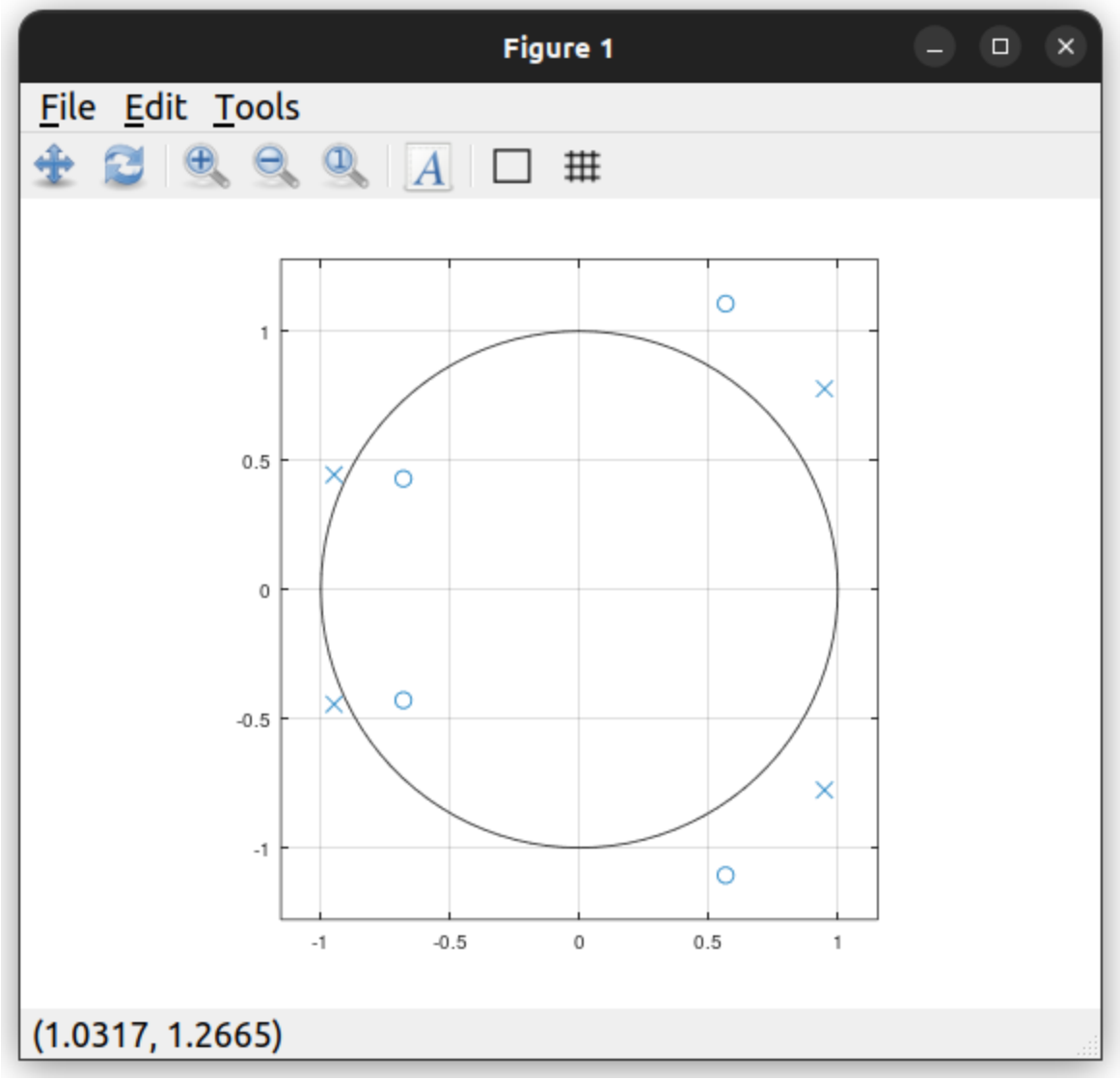
```
zeros =

   0.5660 + 1.1062i
   0.5660 - 1.1062i
  -0.6810 + 0.4288i
  -0.6810 - 0.4288i

poles =

   0.9488 + 0.7766i
   0.9488 - 0.7766i
  -0.9488 + 0.4442i
  -0.9488 - 0.4442i

k = 1
```



b) Zeros , poles and Gain are given as

z = [0.5660 + 1.1062i 0.5660 - 1.1062i -0.6810 + 0.4288i -0.6810 - 0.4288i];

p = [0.9488 + 0.7766i 0.9488 - 0.7766i -0.9488 + 0.4442i -0.9488 - 0.4442i] ;

k = [1];

Map to Transfer function:

Code:

```
pkg load signal;

z = [0.5660 + 1.1062i 0.5660 - 1.1062i -0.6810 + 0.4288i -0.6810 - 0.4288i ];

p = [0.9488 + 0.7766i 0.9488 - 0.7766i -0.9488 + 0.4442i -0.9488 - 0.4442i ] ;

k = [1];

[num , den ]  = zp2tf(z,p,k) ;
```

```
zplane(num , den);
```

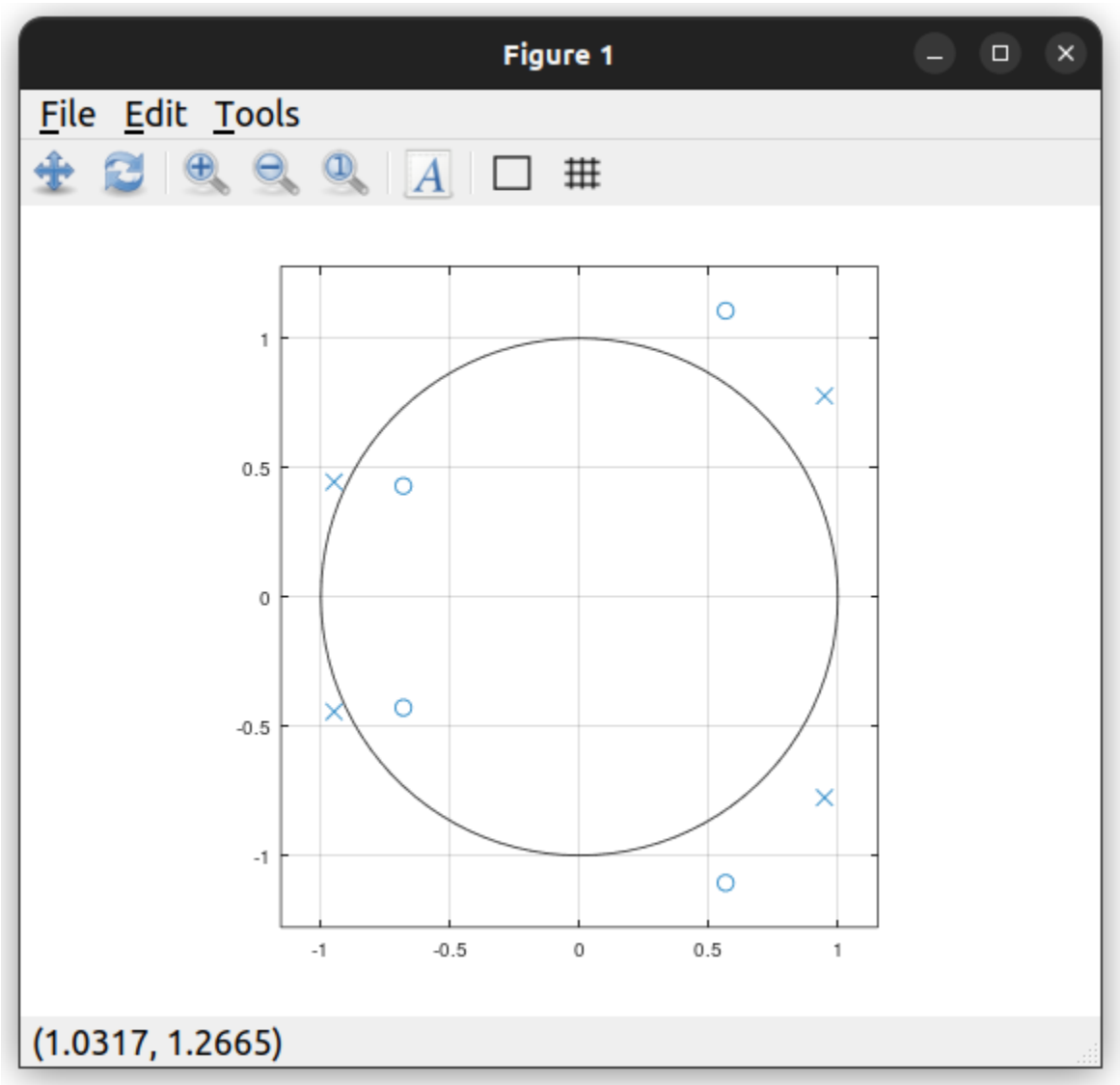
Output:

```
num =

   1.0000   0.2300   0.6499   1.3699   1.0000

den =

   1.0000         0  -1.0000   0.7700   1.6500
```

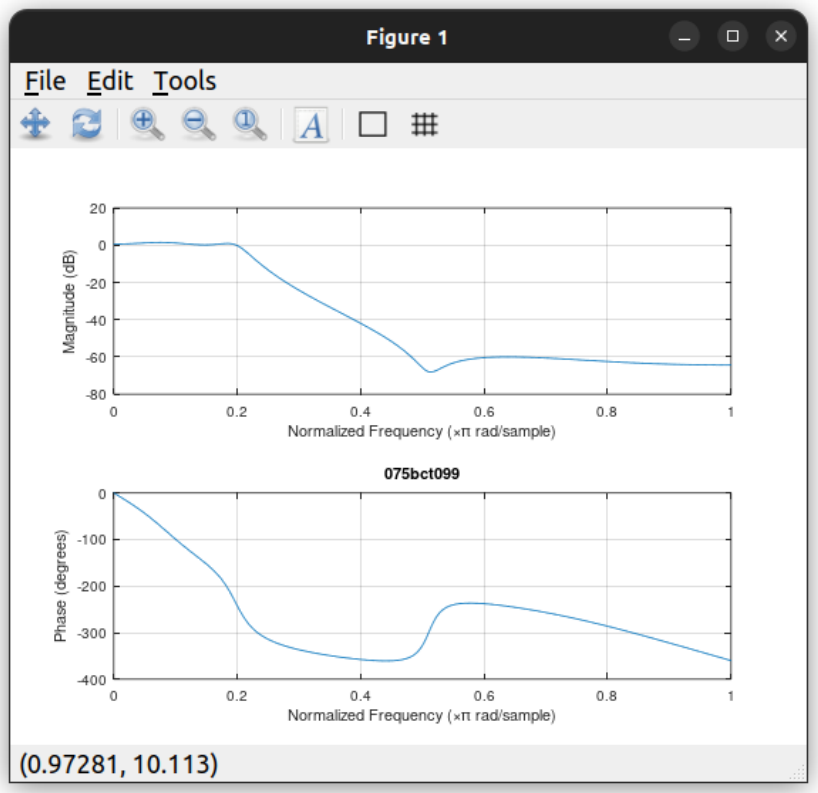


c) Frequency response system

Code:

```
pkg load signal
b = [0.0018, 0.0073, 0.011, 0.007, 0.008];
a = [1, -3.0544, 3.8291, -2.2925, 0.55072];
%c
freqz(b,a);
title("075bct099")
```

Output:



d) In the given LTI system of fig above, if the coefficients 'b' & 'a' are specified as
b0=0.0663, b1=0.1989, b2=-0.1989, b3-0.0663
a0-1, al=-0.9349, a2-0.5668, a3=-0.1015,
then the order of the system is 3 Le. N-3.

Code:

```
b= [0.0663, 0.1989, 0.1989, 0.0663];
a= [1, -0.9349, 0.5668, -0.1015];
freqz(b,a);
```

Output:

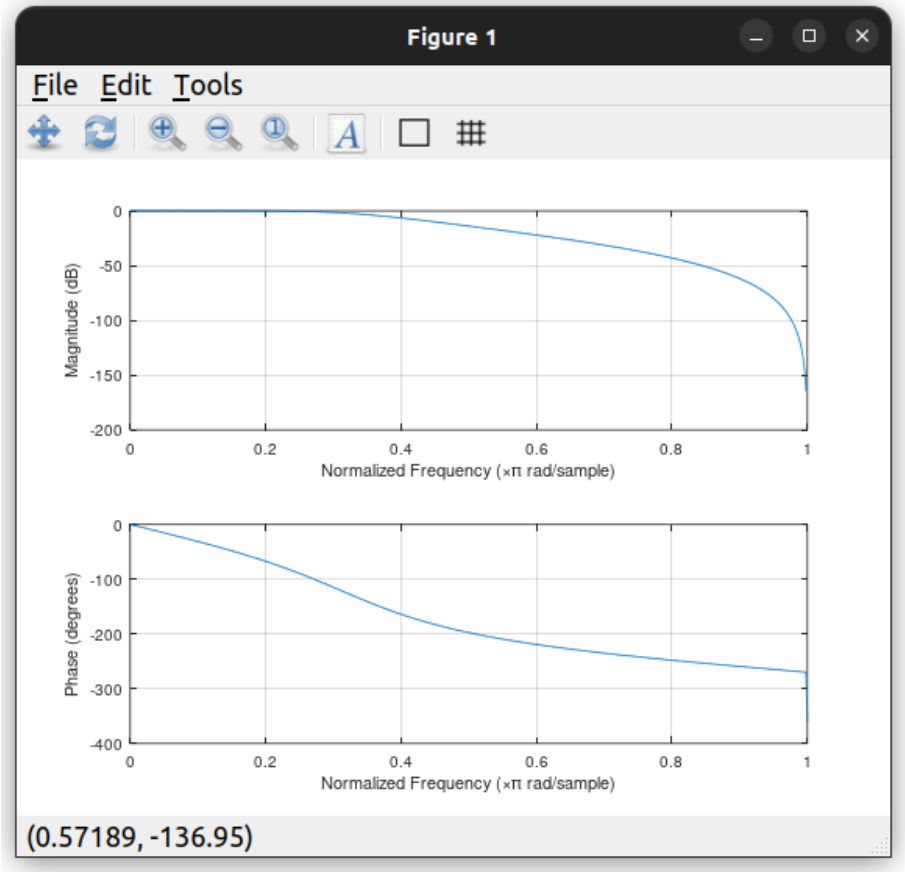


Figure 1
File Edit Tools
Magnitude (dB)
0
-50
-100
-150
-200
0
0.2
0.4
0.6
0.8
1
Normalized Frequency (×π rad/sample)
Phase (degrees)
0
-100
-200
-300
-400
0
0.2
0.4
0.6
0.8
1
Normalized Frequency (×π rad/sample)
(0.57189, -136.95)