

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

Submission Date:
August 24 , 2022

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 =
```

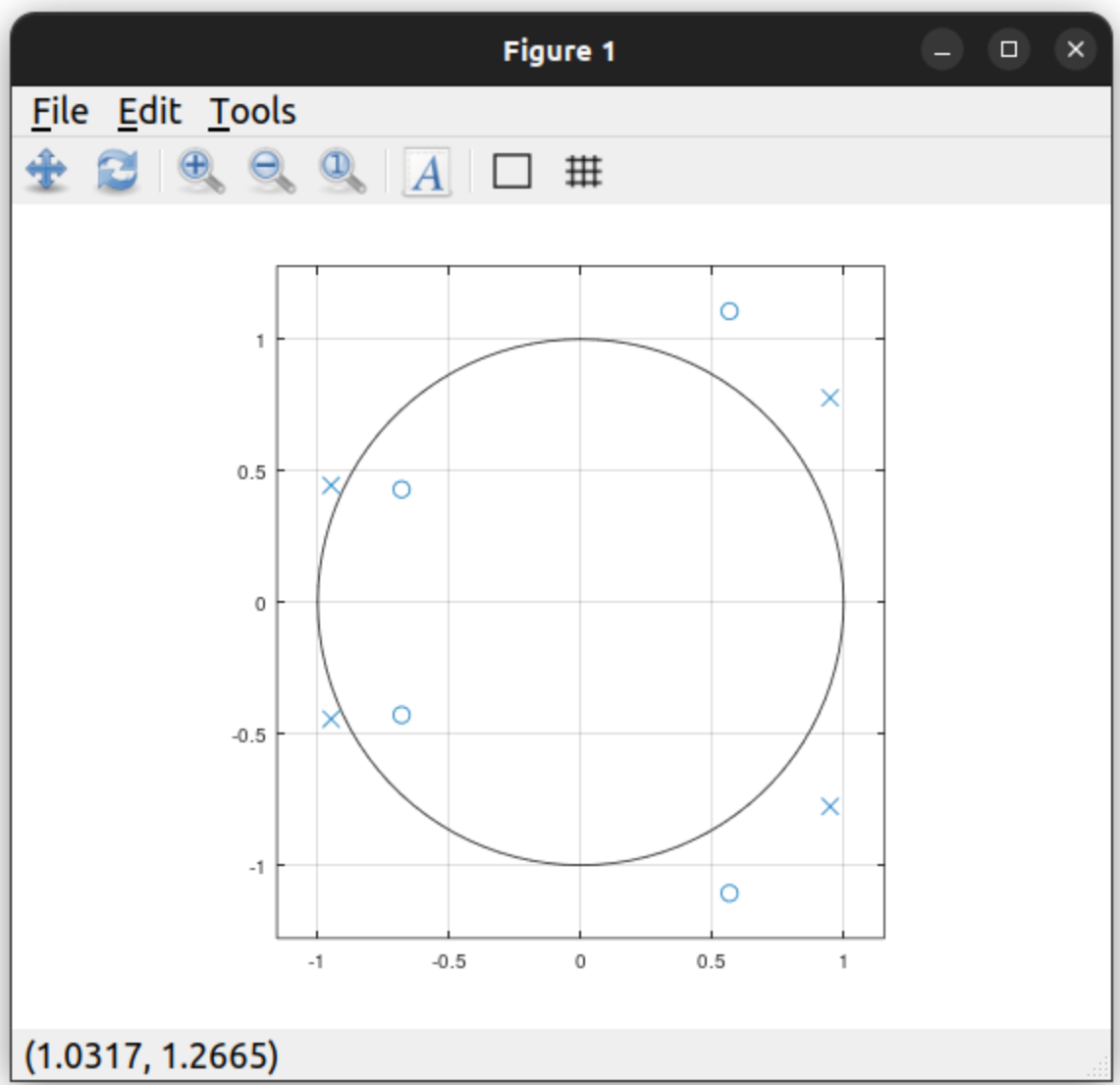
```
0.9488 + 0.7766i
```

```
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);
```

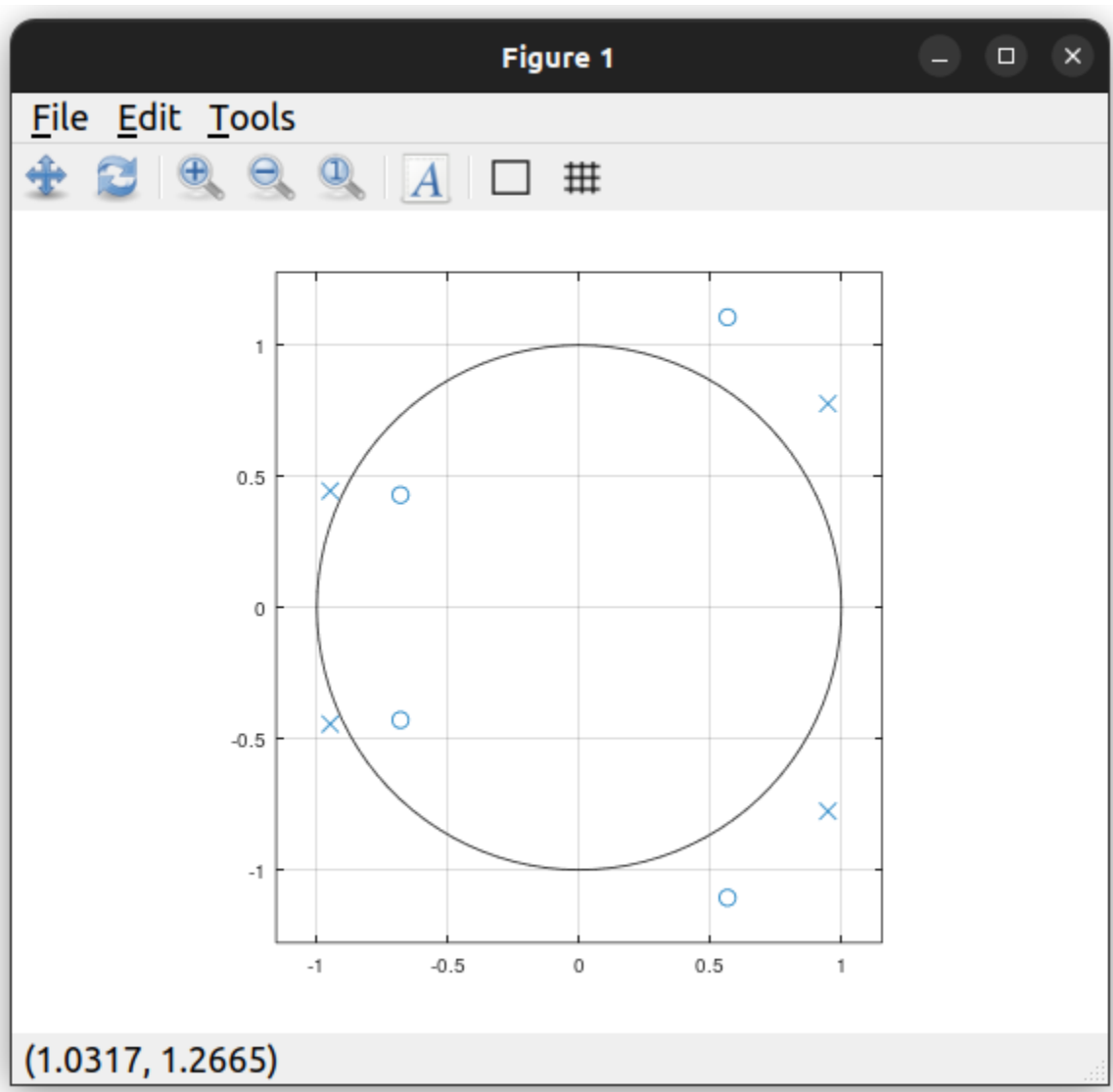
Output:

num =

```
1.0000 0.2300 0.6499 1.3699 1.0000
```

den =

```
1.0000 0 -1.0000 0.7700 1.6500
```



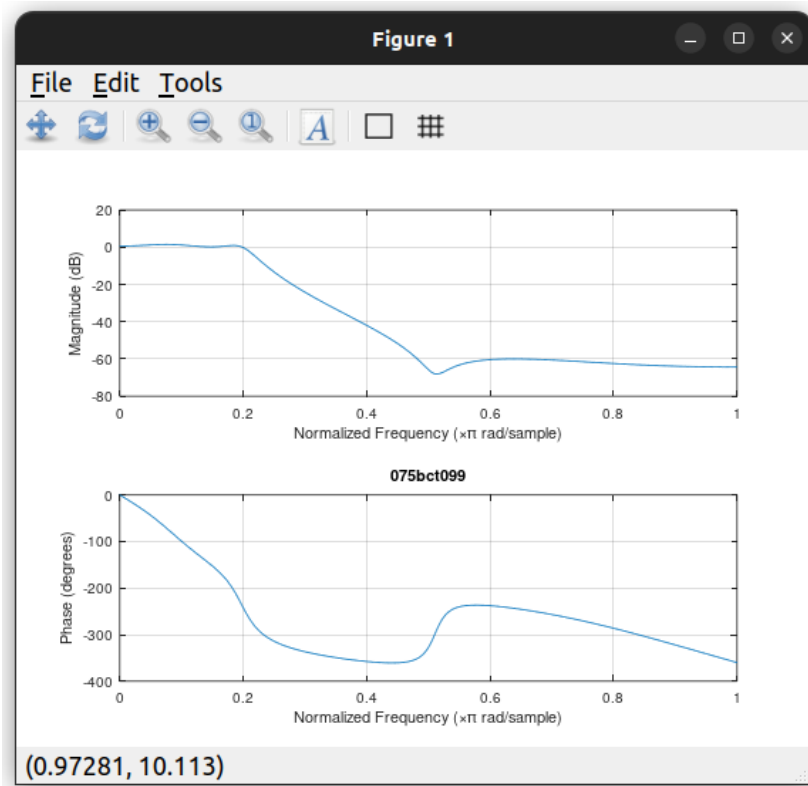
c) Frequency response system

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
 $b_0=0.0663, b_1=0.1989, b_2=-0.1989, b_3=0.0663$
 $a_0=1, a_1=-0.9349, a_2=0.5668, a_3=-0.1015$,
 then the order of the system is 3 Le. N-3.

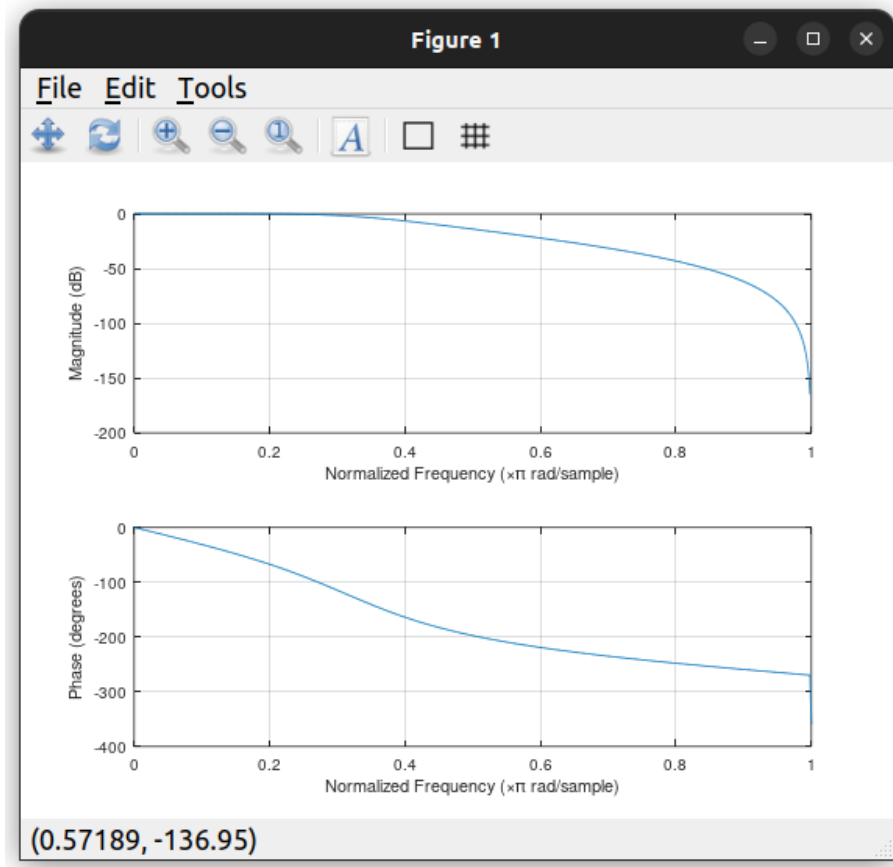
Code:

```

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

```

Output:



Conclusion:

Thus in this lab we performed the Z-transform of impulse response of a LTI system in Octave using an Octave-package called 'signal'. The transfer function was transformed from s-plane to z-plane. The frequency response of the system was also studied using built-in functions.