Lab Report-05

Course no. ECE 4124
Course Title: Digital Signal Processing Sessional

Experiment Title: MATLAB implementation of-

1. Determination of z-transform of causal signal.
2. Determination of z-transform of anti-causal signal.
3. Determination of z-transform of non-causal signal
4. Plotting poles and zeros of a function

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Experiment No.: 05
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1. Determination of z-transform of causal signal.
2. Determination of z-transform of anti-causal signal.
3. Determination of z-transform of non-causal signal
4. Plotting poles and zeros of a function

Theory:

The Z-transform (ZT) is a mathematical tool which is used to convert the difference equations in time domain into the algebraic equations in z-domain.

The Z-transform is a very useful tool in the analysis of a linear shift invariant (LSI) system. An LSI discrete time system is represented by difference equations. To solve these difference equations which are in time domain, they are converted first into algebraic equations in z-domain using the Z-transform, then the algebraic equations are manipulated in z-domain and the result obtained is converted back into time domain using the inverse Z-transform.

A pole is a value of s that makes the denominator of the transfer function equal to zero. In other words, a pole is a point in the complex plane at which the transfer function becomes infinite.

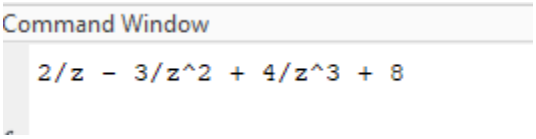
A zero is a value of s that makes the numerator of the transfer function equal to zero. In other words, a zero is a point in the complex plane at which the transfer function becomes zero.

1. Determination of z-transform of causal signal.

Code:

```
clc;
clear all;

x=[8 2 -3 4];
l=length(x);

X=x(1);
z=sym('z');

for i=1:l-1
   X=X+x(i+1)*z^(-i);
end
disp(X);
```

Output:

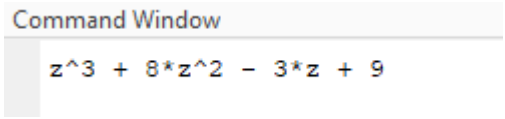


2. Determination of z-transform of anti-causal signal.

Code:

```
clc;
clear all;

x=[1 8 -3 9];
l=length(x);

X=0;

z=sym('z');

for i=1:l
   X= X + x(i)*z^(l-i);
end
disp(X);
```

Output:



3. Determination of z-transform of non-causal signal.

Code:

```
clc;
clear all;

x=[1 8 -3 9 5 8 -2];
l=length(x);
n=input('enter index');
X=0;

z=sym('z');

for i=1:l
   X= X + x(i)*z^(n-i);
end
disp(X);
```

Output:

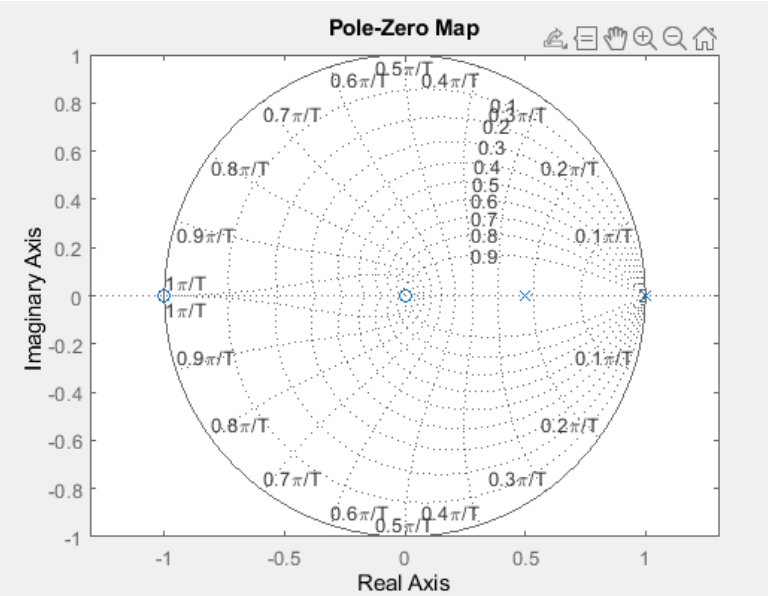
```
enter index 4
5/z - 3*z + 8/z^2 + 8*z^2 - 2/z^3 + z^3 + 9
```

4. Plotting poles and zeros of a function

Code:

```
clc;
clear all;
fs=1000;
num=[1 1 0];
den=[2 -3 1];

H=tf(num,den,fs,'variable','z^-1');

pzmap(H);
axis equal;
zgrid;
```

Output:



Conclusion: Thus we have successfully implemented all the tasks in MATLAB. The output was found relevant to theory.