Rajshahi University of Engineering and Technology

Department of Electrical and Computer Engineering(ECE)

Course Title: Digital Signal Processing Sessional

Course No: ECE 4124

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Experiment Date: 21 May, 2023

Experiment No: 05

Name of the Experiment: Write a code for calculating z-transform of a signal considering left and right sided by using MATLAB.

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. Z transform only exists when the infinite series is convergent. Convergent series is a sum of series which results is fine finite value.

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 system is said to be causal if input does not depend on future values of that input but depends only on the present or past values of the input. y(n) = x(n) is the example of causal system.

A system is said to be non-causal if input depends on future values of that input. y(n-1) = x(n) is the example of non-causal system.

Code:

Code for z-transform of a signal considering left and right sided:

```
clc
clear all
close all
x = [1 2 3 4 5 6 7];
l = length(x);
y = sym('z');
zt_l = 0;
zt_r = 0;
for i=1:l
        zt_l = zt_l+x(i)*y^(-i);
    end
    for i=1:l
        zt_r = zt_r+x(i)*y^(i);
    end
    disp('Right = ')
    disp(zt_l)
    disp('Left = ')
    disp(zt_r)
```

Output:

Output for z-transform of a signal considering left and right sided:

```
Right =
1/z + 2/z^2 + 3/z^3 + 4/z^4 + 5/z^5 + 6/z^6 + 7/z^7

Left =
7*z^7 + 6*z^6 + 5*z^5 + 4*z^4 + 3*z^3 + 2*z^2 + z
```

Discussion: Z-transform code was implemented using MATLAB. For implementing the z transform code considering left and right sided, a signal was taken. The signal length was calculated using length function. Then a for loop was used. In the for loop a condition was written for left sided. Then another for loop was used for right sided condition. After the for loop output was displayed.

Conclusion: The code was executed successfully and no errors were found. Form this experiment, we had learned about z-transform.