

**Independent University Bangladesh**

Department of Electrical and Electronics Engineering

**Lab Report** **03**

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Course code: EEE 321L

Couse name: Digital Signal Processing Lab

Lab no: 03

Lab title: Study of signal manipulation

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1. **Signal generations**
   1. u(n+1) + u(n-2) where -5 ≤ n ≤ 5

Call:

% (addition) x(n) = u(n+1) + u(n-2), -5:5

n = -5:5;

x = stepseq(-1,-5,5) + stepseq(2,-5,5);

stem(n,x)

Output:



* 1. x(n) = δ(n+3) + 2δ(n-2) where -5≤ n ≤ 5

Call:

% (scaling) x(n) = d(n+3) + 2d(n-2), -5:5

n = -5:5;

x = impseq(-3,-5,5) + 2\*impseq(2,-5,5);

stem(n,x)

Output: 

* 1. x(n) = n/u(n-2) where -5 ≤ n ≤ 5

Call:

% (division) x(n) = n/u(n-2), -5:5

n = -5:5;

x = n./stepseq(2,-5,5); % dot for element-wise operation

stem(n,x)

Output:



* 1. x(n) = n[u(n)-u(n-5)] where -5 ≤ n ≤ 5

Call:

% (multiplication) x(n) = n[u(n)-u(n-5)], -5:5

n = -5:5;

x = n.\*(stepseq(0,-5,5)-stepseq(5,-5,5));

stem(n,x)

Output:



* 1. x(n) = n^2u(n+2) where -5 ≤ n ≤ 5

Call:

% (power) x(n) = n^2u(n+2), -5:5

n = -5:5;

x = (n.^2).\*(stepseq(-2,-5,5));

stem(n,x)

Output:



* 1. u(n+1) - 2δ(n-2) where -5 ≤ n ≤ 5

Call:

% x(n) = u(n+1)-2d((n-2), -5:5

n = -5:5;

x = stepseq(-1,-5,5)-2\*impseq(2,-5,5);

stem(n,x)

Output:



* 1. x(n) = n[u(n)-u(n-5)] + 10e^[-0.5(n-5)] where -5 ≤ n ≤ 5

Call:

%(exponential) x(n) = n[u(n)-u(n-5)] + 10e^[-0.5(n-5)], -5:5

n = -5:5;

x = n.\*(stepseq(0,-5,5)-stepseq(5,-5,5)) + 10\*exp(-0.5\*(n-5));

stem(n,x)

Output:



1. **Magnitude, real part, imaginary part and phase angle of complex signal**
   1. x(n) = e^[-j0.5(n-5)] where -10 ≤ n ≤ 10

Code:

% x(n) = e^[-j0.5(n-5)], -10:10

n = -10:10;

% complex signal

x = exp(-0.5\*(n-5)\*i);

stem(n,x)

% magnitude

mag = abs(x);

stem(n,mag)

% real part

xreal = real(x);

stem(n,xreal)

% imaginary part

ximag = imag(x);

stem(n,ximag)

% phase angle

a = angle(x);

stem(n,a)

Outputs:

  
Signal waveform

  
Magnitude of complex signal

  
Real part

  
Imaginary part

  
Figure: Phase angle

* 1. x(n) = e^[j0.5(n-5)] where -10 ≤ n ≤ 10

Code:

% x(n) = e^[j0.5(n-5)], -10:10

n = -10:10;

% complex signal

x = exp(-0.5\*(n-5)\*i);

stem(n,x)

% magnitude

mag = abs(x);

stem(n,mag)

% real part

xreal = real(x);

stem(n,xreal)

% imaginary part

ximag = imag(x);

stem(n,ximag)

% phase angle

a = angle(x);

stem(n,a)

Outputs:

  
Signal waveform

  
Magnitude of complex signal

  
Real part

  
Imaginary part

  
Phase angle

1. Assignment

**Definition**:

function [] = adc(f, fs)

p = 1/f;

t = 0:p/100:p;

x = sin(2\*pi\*f\*t);

figure;

subplot(2,1,1);

plot(t,x)

ts = 1/fs;

n = t./ts;

subplot(2,1,2);

stem(n,x)

end

**Call**:

adc(20, 200);

**Output**:

