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

Date: 24/11/2020

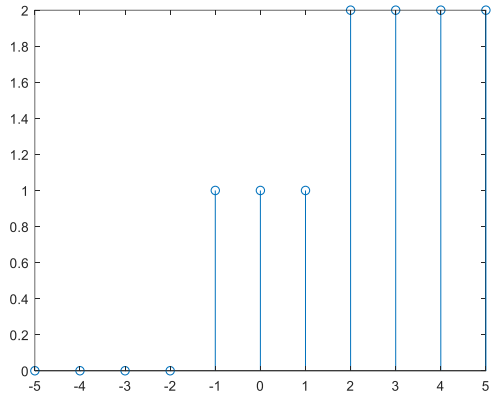
a) Signal generations

i. 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:

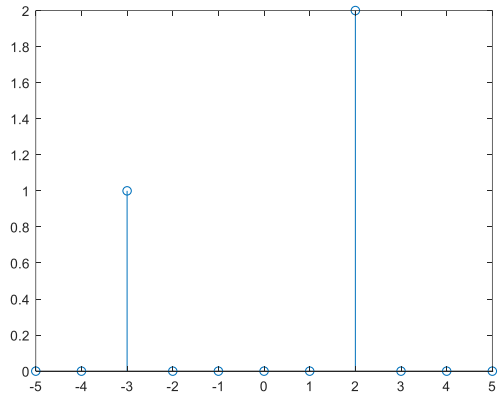


ii. x(n) = δ(n+3) + 2δ(n-2) where -5≤ n ≤ 5

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:

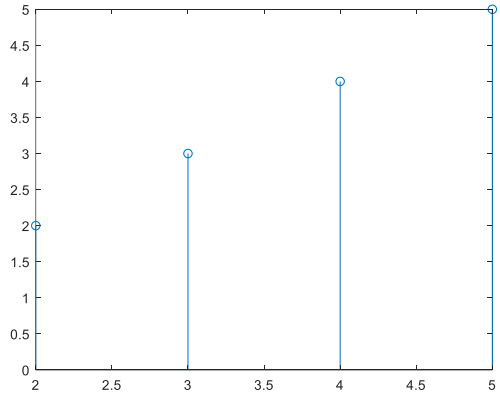


iii. x(n) = n/u(n-2) where -5 ≤ n ≤ 5

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:

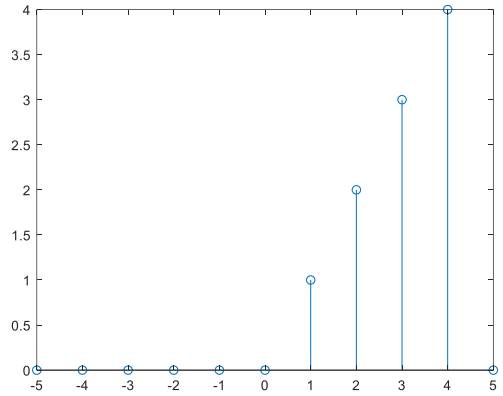


iv. x(n) = n[u(n)-u(n-5)] where -5 ≤ n ≤ 5

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:

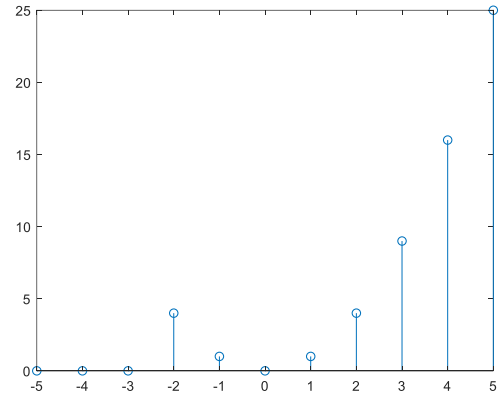


v. x(n) = n^2u(n+2) where -5 ≤ n ≤ 5

Call:

```
% (power) x(n) = n^2u(n+2), -5:5
n = -5:5;
x = (n.^2).*(stepseq(-2,-5,5));
stem(n,x)
```

Output:

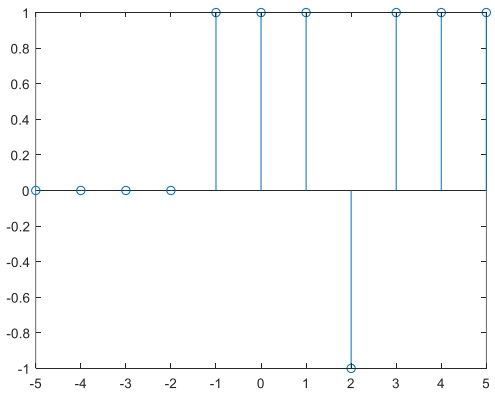


vi. u(n+1) - 2δ(n-2) where -5 ≤ n ≤ 5

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:

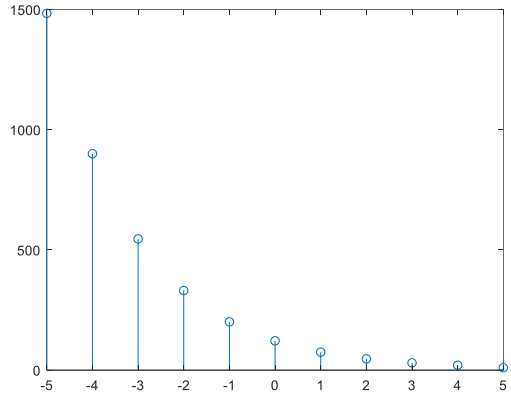


vii. x(n) = n[u(n)-u(n-5)] + 10e^[-0.5(n-5)] where -5 ≤ n ≤ 5

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:



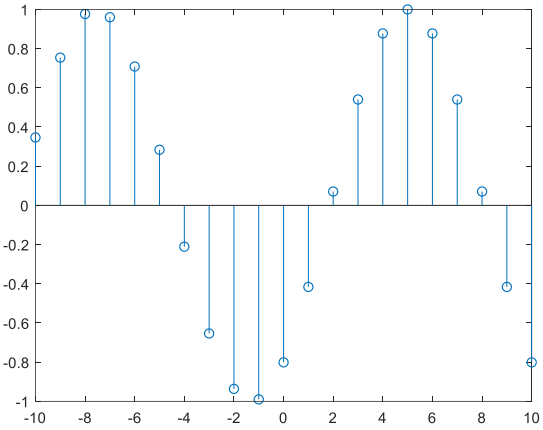
b) Magnitude, real part, imaginary part and phase angle of complex signal

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

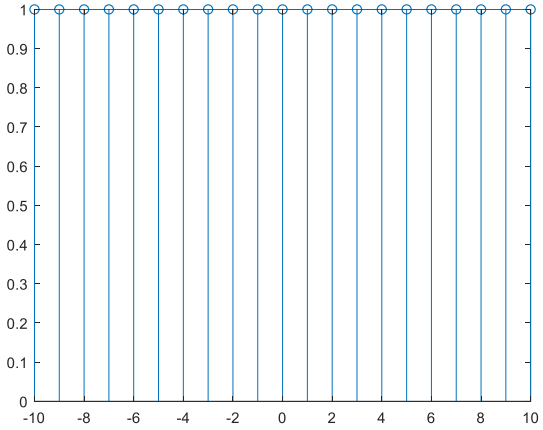
Code:

```
% 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)
```

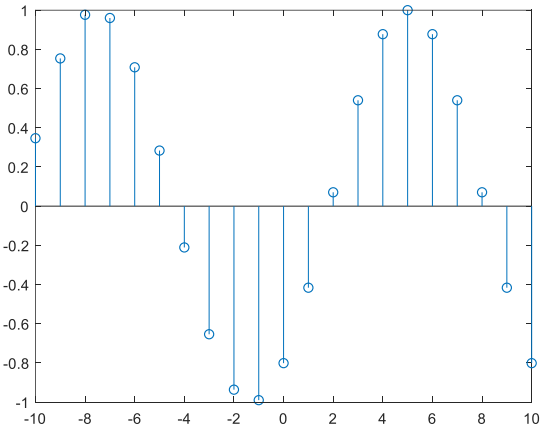
Outputs:



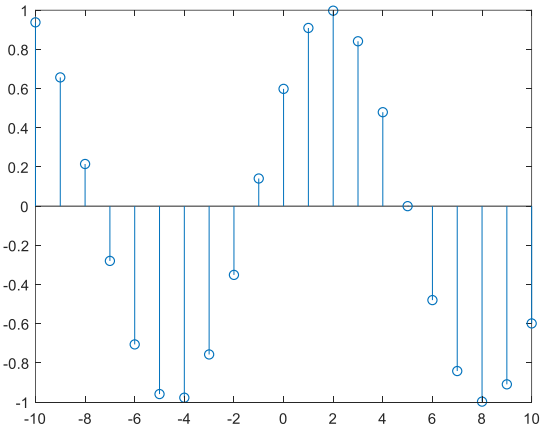
Signal waveform



Magnitude of complex signal



Real part



Imaginary part

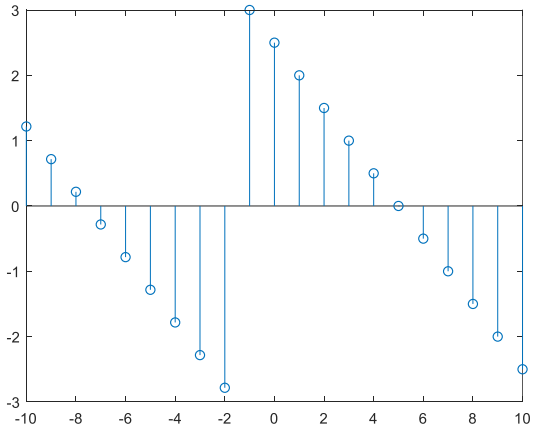


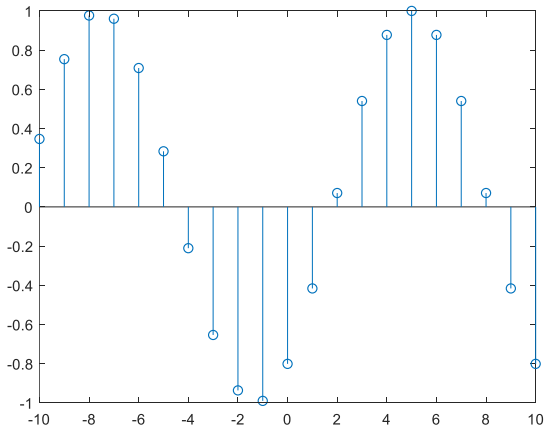
Figure: Phase angle

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

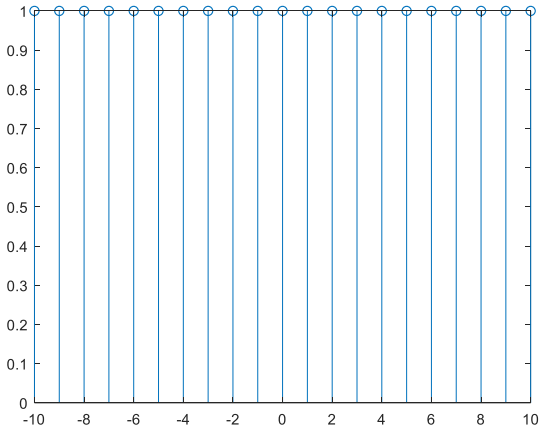
Code:

```
% 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)
```

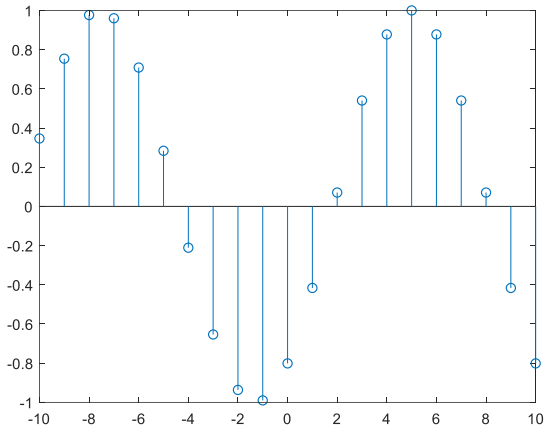
Outputs:



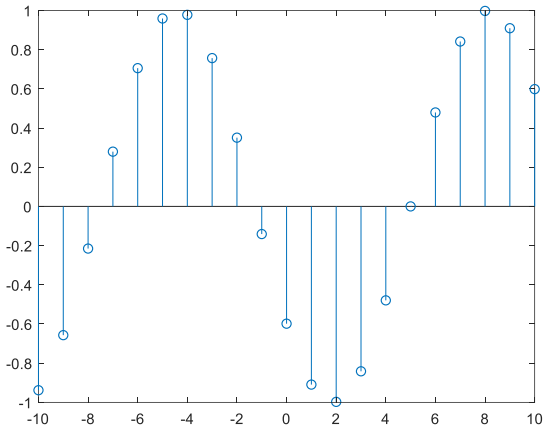
Signal waveform



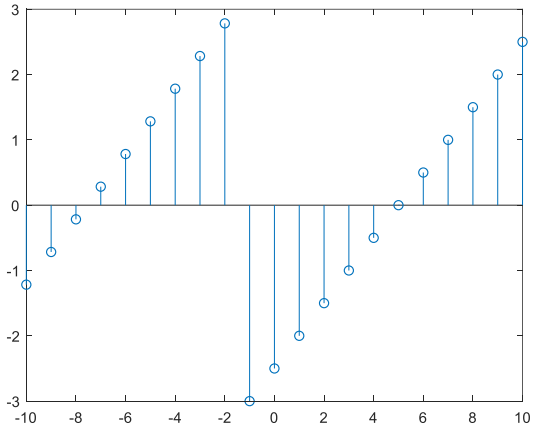
Magnitude of complex signal



Real part



Imaginary part



Phase angle

c) 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: