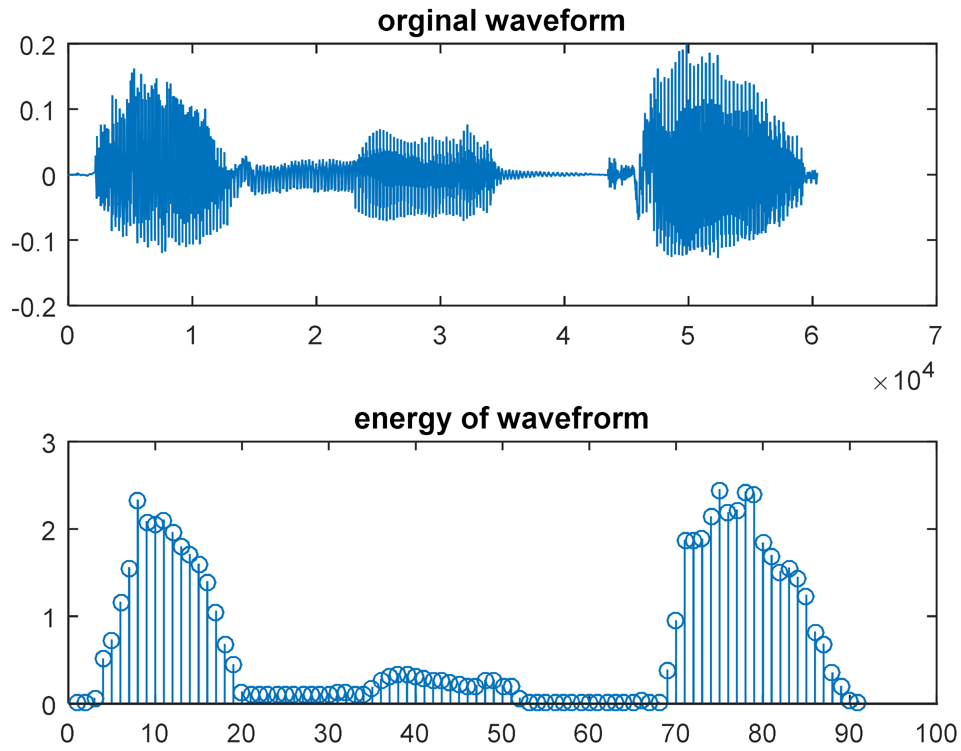
Labsheet 4

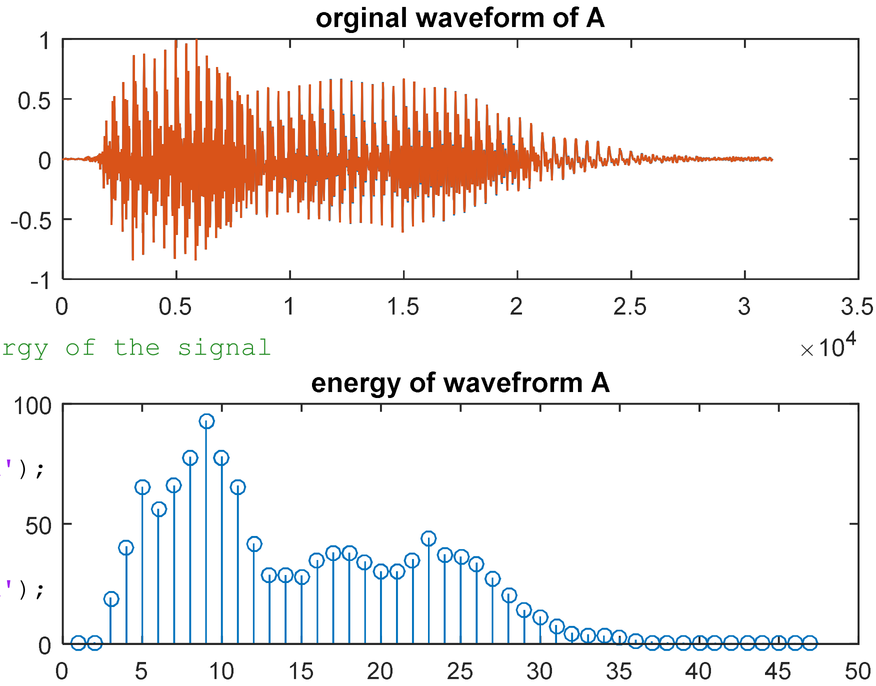
1. From the segmented speech signal in the previous lab sheet, calculate the short time energy. The segments should be 30 msec duration with 50% overlap



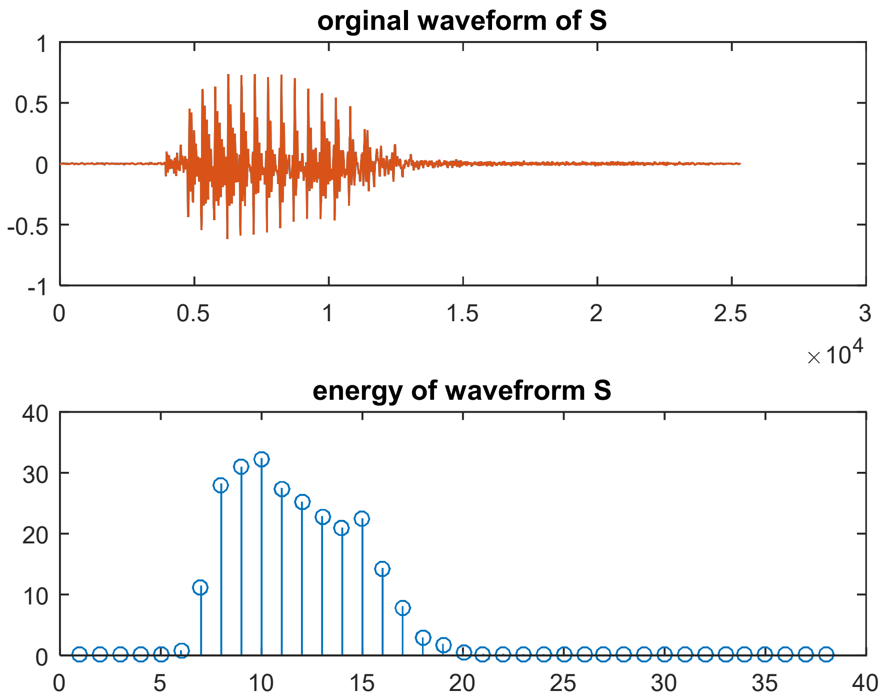

```
clc
clear
clear
[a,fs]=audioread('speech.wav');
n=0.03*fs;
off=floor(0.015*fs);
v=1;
ln=length(a);
t=floor(ln/(n-off));
%segmenting
for i=1:t

    for j=1:n
        if v<=ln
        x(i,j)=a(v);
        v=v+1;
        else
         x(i,j)=0;
        end
    end
    v=v-off;
end

%generating hamming
window
h=hamming(n);

%multipling with
hamming window
for i=1:t
    for j=1:n
        z(i,j)=x(i,j)*h(j);
    end
end

%fnding energy
E=zeros(1,t);
for i=1:t
    for j=1:n
        E(i)=E(i)+(z(i,j))^2;
    end
end

%ploting the waveform vs energy of the signal
subplot(2,1,1);
plot(a);
title('orginal waveform');
subplot(2,1,2);
num=1:t;
stem(num,E);
title('energy of wavefrorm');
```

2. Record the alphabet ‘a’ and alphabet‘s’. Compare the short time energy in each case. Comment on your inference

Code:




```
clc
clear
clear
[a,fs1]=audioread('a.wav');
[s,fs2]=audioread('s.wav');

% procession of A
[A,t1]=energy(a,fs1);
figure(1);
%ploting the waveform vs energy of the signal
subplot(2,1,1);

plot(a);
title('orginal waveform of A');
subplot(2,1,2);
num=1:t1;
stem(num,A);
title('energy of wavefrorm A');


% procession of B
[S,t2]=energy(s,fs2);
figure(2);
%ploting the waveform vs energy of the signal
subplot(2,1,1);
plot(s);
title('orginal waveform of
S');
subplot(2,1,2);
num=1:t2;
stem(num,S);
title('energy of wavefrorm
S');
```

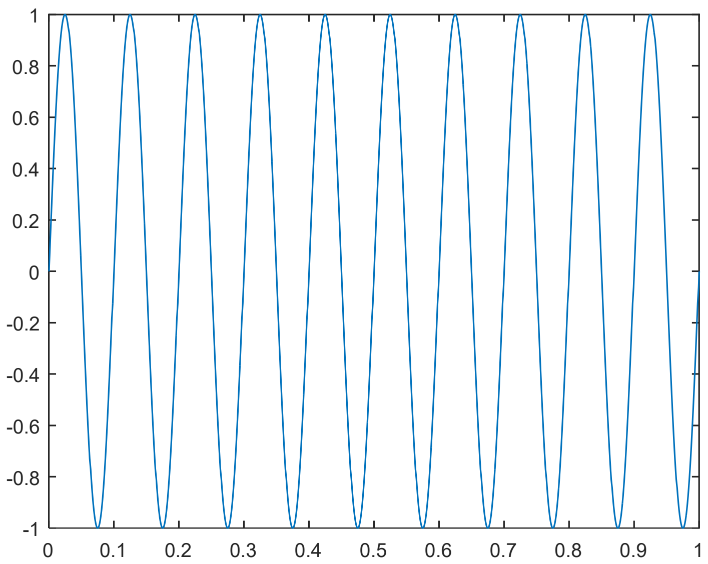



```
FUNCTON:
function[E,t]=energy(a,fs)
n=0.03*fs;
off=floor(0.015*fs);
v=1;
ln=length(a);
t=floor(ln/(n-off));
%segmenting
for i=1:t
    for j=1:n
        if v<=ln
        x(i,j)=a(v);
        v=v+1;
        else
         x(i,j)=0;
        end
    end
    v=v-off;
end

%generating hamming window
h=hamming(n);

%multipling with hamming window
for i=1:t
    for j=1:n
```

```
        z(i,j)=x(i,j)*h(j);
    end
end

%fnding energy
E=zeros(1,t);
for i=1:t
    for j=1:n
        E(i)=E(i)+(z(i,j))^2;
    end
end
```

3. Plot one cycle of the sine wave and verify the number of zero crossings using the above equation.
Code:

```
clc
clear
f=10;
fs=1000;
t=0:1/fs:1;
s=sin(2*pi*f*t);
plot(t,s);%ploting the
n=length(s);
z=0;


for i=2:n
    if i<n-1
   z = z+(abs(sign(s(i+1))-
sign(s(i))));
    end
end
z=floor(z/2)% gettng the value of z
right
```




```
OUTPUT:
z = 19
```

4. From the segmented speech signal in the previous lab sheet, calculate the short time ZCR. The segments should be 30 msec duration with 50% overlap.
Code:

```
clc
clear
%importng the audio files
[a,fs]=audioread('speech.wav');

%segmenting wave
[A,n,t]=segment(a,fs);

%generating hamming window
h=hamming(n);

%finding zero count of each segment
z=zeros(t,1);

for i=1:t
    for j=1:n
        if j<n-1
        z(i)=z(i)+(abs(sign(A(i,j+1))-sign(A(i,j))))*h(j);
        end
    end
    z(i)=floor(z(i)/2);
end
z
```

```
FUNCTION:
function[x,n,t]=segment(amp,fs)
n=0.06*fs;
off=floor(0.03*fs);
v=1;
ln=length(amp);
t=floor(ln/(n-off));
%segmenting
for i=1:t
    for j=1:n
        if v<=ln
        x(i,j)=amp(v);
        v=v+1;
        else
         x(i,j)=0;
        end
    end
    v=v-off;
end

OUTPUT:
z = 24 32 30 27 31 31 34
```

5. Record the alphabet ‘a’ and alphabet‘s’. Compare the short time energy in each case. Comment on your inference.

Code:

```
clc
clear
%importng the audio files
[a,fs1]=audioread('a.wav');
[s,fs2]=audioread('s.wav');

%segmenting a
[A,n,t]=segment(a,fs1);

%generating hamming window
h=hamming(n);

%finding zero count of each segment
za=zeros(t,1);

for i=1:t
    for j=1:n
        if j<n-1
        za(i)=za(i)+(abs(sign(A(i,j+1))-sign(A(i,j))))*h(j);
        end
    end
    za(i)=floor(za(i)/2);
end
za

%segmenting b
[B,n,t]=segment(s,fs2);

%generating hamming window
h=hamming(n);

%finding zero count of each segment
zb=zeros(t,1);

for i=1:t
    for j=1:n
```

```
        if j<n-1
        zb(i)=zb(i)+(abs(sign(B(i,j+1))-sign(B(i,j))))*h(j);
        end
    end
    zb(i)=floor(zb(i)/2);
end
zb
```

OUTPUT:

za = 90 35 33 30 31 29 28 31 30 30 25 25 25 24 26 28 23 25 64 54 91 102 83

zb = 164 127 82 35 32 29 31 29 30 50 122 180 162 183 214 218 184 141 95

6. From one segment of speech signal plot the

Code:

```
clc
clear
%importng the audio files
[a,fs]=audioread('speech.wav');

%segmenting wave
[A,n,t]=segment(a,fs);
for i=1:20
seg=A(i,1:n);
R=xcorr(seg);

%finding peaks
[pks,locs]=findpeaks(R);
[pk,mloc]=max(pks);
%locaton of first max
loc1=locs(mloc);
%findng location of second
max
pks(mloc)=0;
[pk,mloc]=max(pks);
loc2=locs(mloc);
P(i)=loc1-loc2;
PF(i)=1/P(i);
figure(i);
plot(R);
end
P
mean_P=mean(P)
OUTPUT:
mean_P = 283.4500
```