

---

## Table of Contents

.....	1
1 - a) .....	1
1 - b) .....	2
2 - a) .....	4
2 - b) .....	4
2 - c) .....	5
2 - d) .....	6
3 -----	6
1 - a) .....	7
1 - b) .....	8
2 - a) .....	9
2 - b) .....	10
2 - c) .....	10
2 - d) .....	11

```
% Ricardo dos Santos - 1380320
close all
clear all
clc
load sound2.mat
%sound(m1,fs);
%sound(m2,fs);

N = length(m1);
T = 1 / fs;
t = (0:N-1)*T;
fc = 20*(10^3);

c1 = cos(2*pi*fc.*t);
c2 = sin(2*pi*fc.*t);

s1 = m1.*c1;
s2 = m2.*c2;
```

### 1 - a)

```
figure(1)
% m1
subplot(4,1,1)
plot(t,m1)
grid on
title("m1(t)");
xlim([0.80 0.81]);

% m2
subplot(4,1,2)
```

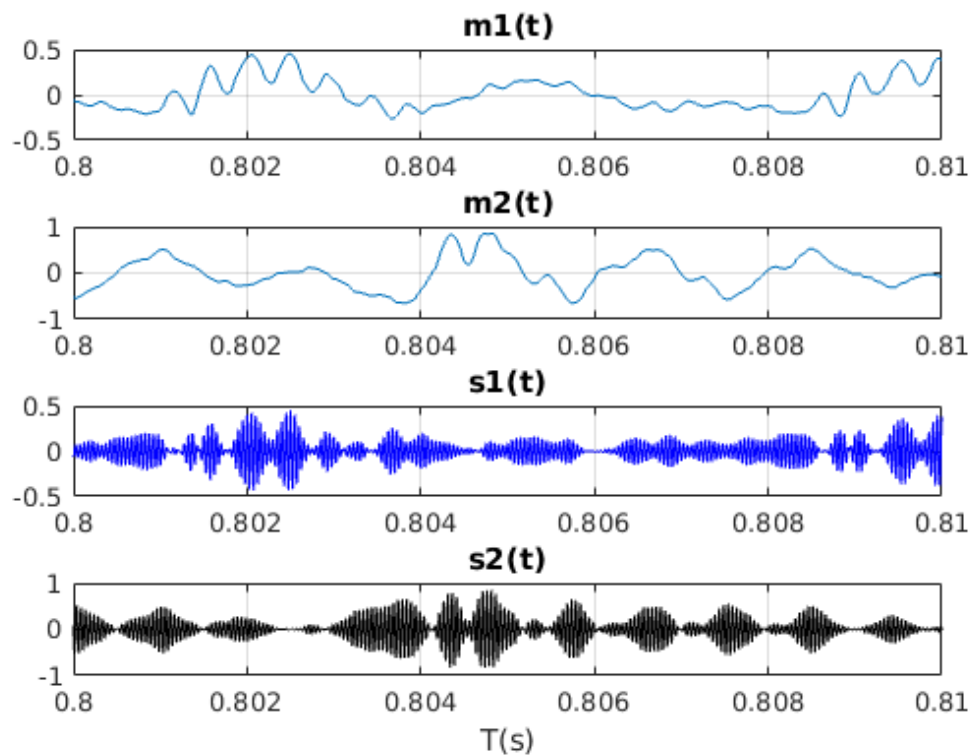
```

plot(t,m2)
grid on
title("m2(t)");
xlim([0.80 0.81]);

% s1
subplot(4,1,3)
plot(t,s1,'b')
grid on
title('s1(t)')
xlim([0.8 0.81])

subplot(4,1,4)
plot(t,s2,'k')
grid on
title("s2(t)");
xlim([0.80 0.81]);
xlabel('T(s)')

```



**1 - b)**

```

M1 = abs(fftshift(fft(m1)))/N;
M2 = abs(fftshift(fft(m2)))/N;
S1 = abs(fftshift(fft(s1)))/N;
S2 = abs(fftshift(fft(s2)))/N;
f = (-fs/2:fs/N:(fs/2-fs/N))./1000;
figure(2)

```

---

```

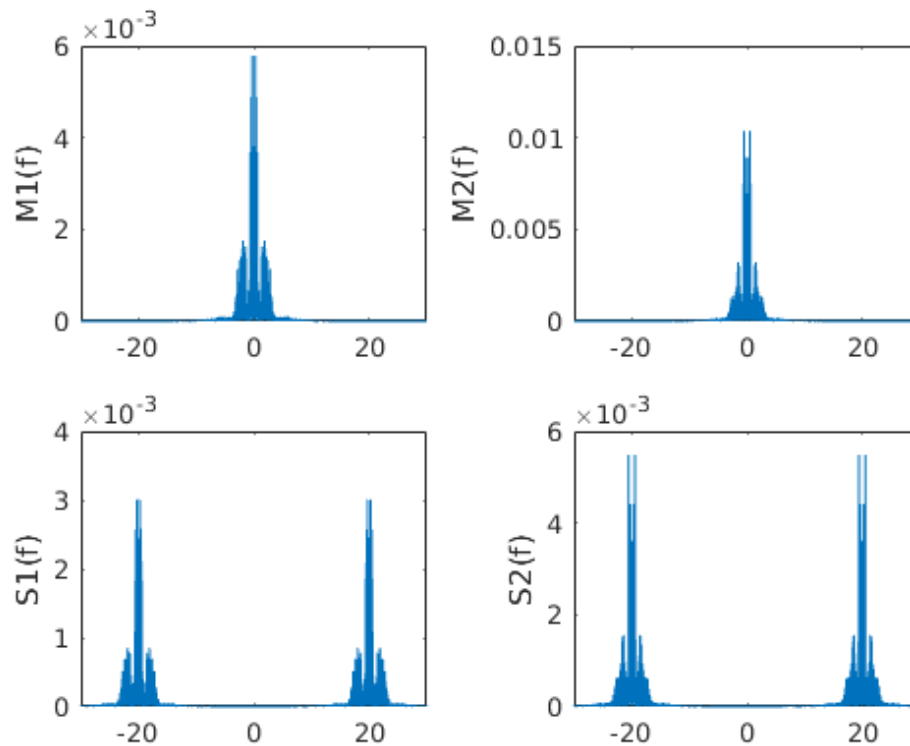
%i)|M1(f)|
subplot(2,2,1)
plot(f,M1)
xlim([-30 30])
%title('Sinal |M(f)|')
ylabel('M1(f)')

%i)|M2(f)|
subplot(2,2,2)
plot(f,M2)
xlim([-30 30])
%title('Sinal |M(f)|')
ylabel('M2(f)')

%i)|S1(f)|
subplot(2,2,3)
plot(f,S1)
xlim([-30 30])
%title('Sinal |M(f)|')
ylabel('S1(f)')

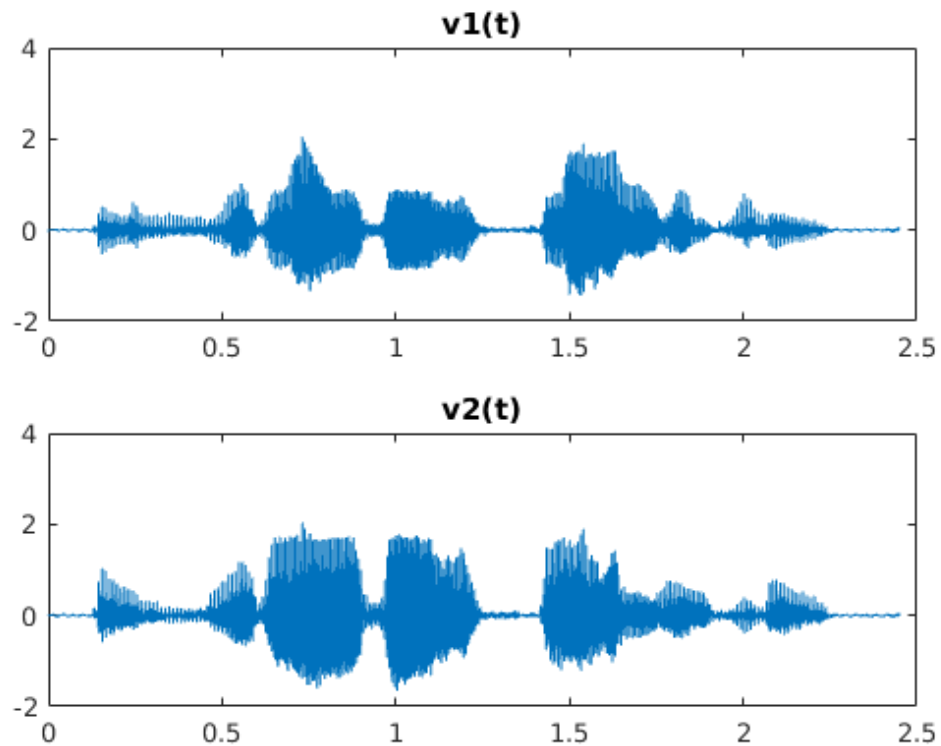
%i)|S2(f)|
subplot(2,2,4)
plot(f,S2)
xlim([-30 30])
ylabel('S2(f)')

```



## 2 - a)

```
s = s1 + s2;  
  
v1 = s.*2.*cos(2*pi*fc.*t);  
v2 = s.*2.*sin(2*pi*fc.*t);  
  
figure(3);  
subplot(2,1,1);  
plot(t,v1);  
%xlim([-30 30]);  
title('v1(t)');  
  
subplot(2,1,2);  
plot(t,v2);  
%xlim([-30 30]);  
title('v2(t)');
```



## 2 - b)

```
fcorte = 6000/(fs/2);  
h = fir1(2000,fcorte);  
[H, fh] = freqz(h,1,N/2+1,fs/1000) ;  
H = abs(H);  
vo1 = filter(h,1,v1);  
vo2 = filter(h,1,v2);
```

---

## 2 - c)

```
S = abs(fftshift(fft(s)))/N;

V1 = abs(fftshift(fft(v1)))/N;
V2 = abs(fftshift(fft(v2)))/N;
Vo1 = abs(fftshift(fft(vo1)))/N;
Vo2 = abs(fftshift(fft(vo2)))/N;

figure(4)

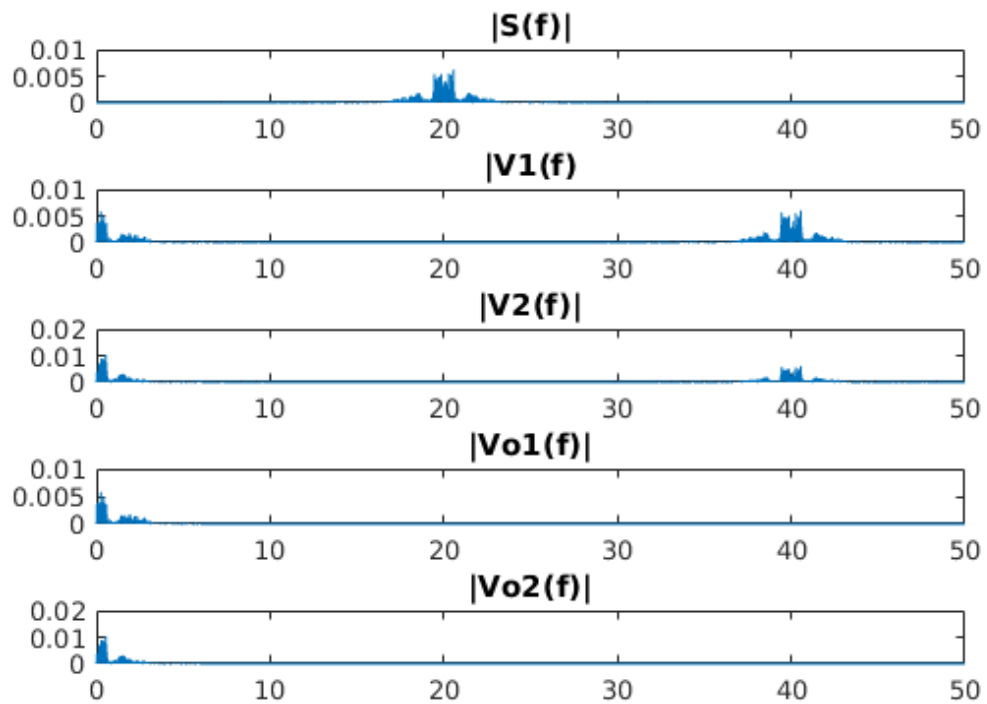
subplot(5,1,1)
plot(f,S);
xlim([0 50]);
title(' |S(f)| ');

subplot(5,1,2)
plot(f,V1);
xlim([0 50]);
title(' |V1(f)| ');

subplot(5,1,3)
plot(f,V2);
xlim([0 50]);
title(' |V2(f)| ');

subplot(5,1,4)
plot(f,Vo1);
xlim([0 50]);
title(' |Vo1(f)| ');

subplot(5,1,5)
plot(f,Vo2);
xlim([0 50]);
title(' |Vo2(f)| ');
```



## 2 - d)

```
% Com uma análise gráfica, aparentemente ficaram iguais,  
respectivamente.  
%sound(m1,fs)  
%sound(m2,fs)  
%sound(vo1,fs)  
sound(vo2,fs)
```

## 3

---

```
close all  
clear all  
clc  
load sound2.mat  
%sound(m1,fs);  
%sound(m2,fs);  
  
N = length(m1);  
T = 1 / fs;  
t = (0:N-1)*T;  
fc = 20*(10^3);
```

---

```
%Aqui ocorrem as mudanas de fase
c1 = 2*cos(2*pi*fc.*t + pi/4);
c2 = 2*sin(2*pi*fc.*t + pi/4);

s1 = m1.*c1;
s2 = m2.*c2;
```

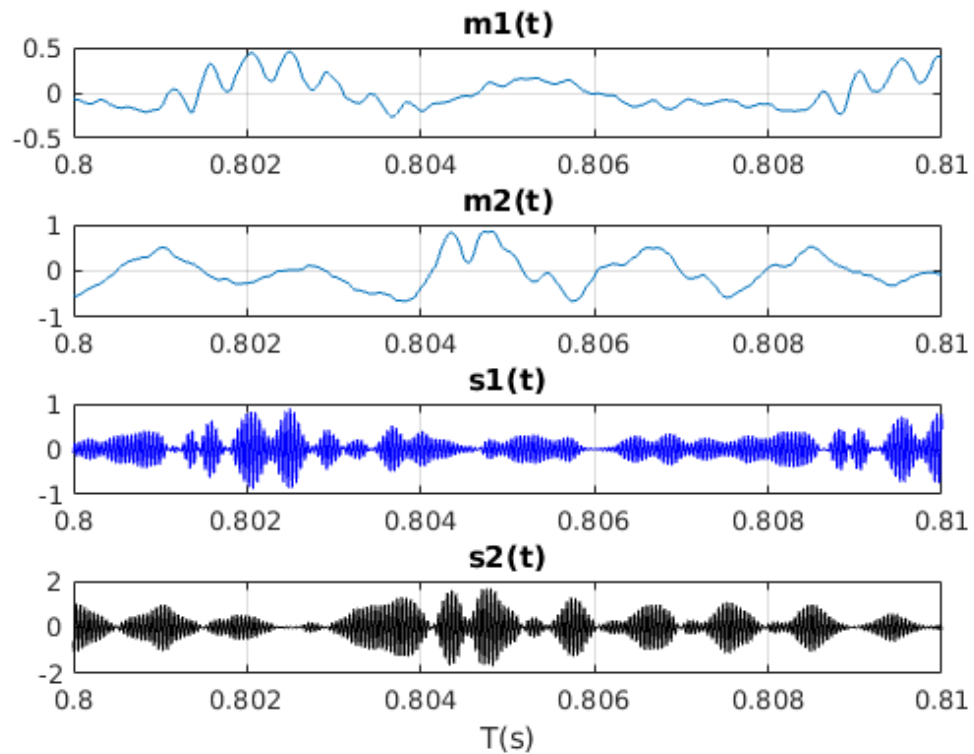
## 1 - a)

```
figure(1)
% m1
subplot(4,1,1)
plot(t,m1)
grid on
title("m1(t)");
xlim([0.80 0.81]);

% m2
subplot(4,1,2)
plot(t,m2)
grid on
title("m2(t)");
xlim([0.80 0.81]);

% s1
subplot(4,1,3)
plot(t,s1, 'b')
grid on
title('s1(t)')
xlim([0.8 0.81])

subplot(4,1,4)
plot(t,s2, 'k')
grid on
title("s2(t)");
xlim([0.80 0.81]);
xlabel('T(s)')
```



**1 - b)**

```
M1 = abs(fftshift(fft(m1)))/N;
M2 = abs(fftshift(fft(m2)))/N;
S1 = abs(fftshift(fft(s1)))/N;
S2 = abs(fftshift(fft(s2)))/N;
f = (-fs/2:fs/N:(fs/2-fs/N))./1000;
figure(2)
%i |M1(f)|
subplot(2,2,1)
plot(f,M1)
xlim([-30 30])
%title('Sinal |M(f)|')
title('M1(f)')

%i |M2(f)|
subplot(2,2,2)
plot(f,M2)
xlim([-30 30])
%title('Sinal |M(f)|')
title('M2(f)')

%i |S1(f)|
subplot(2,2,3)
plot(f,S1)
xlim([-30 30])
```



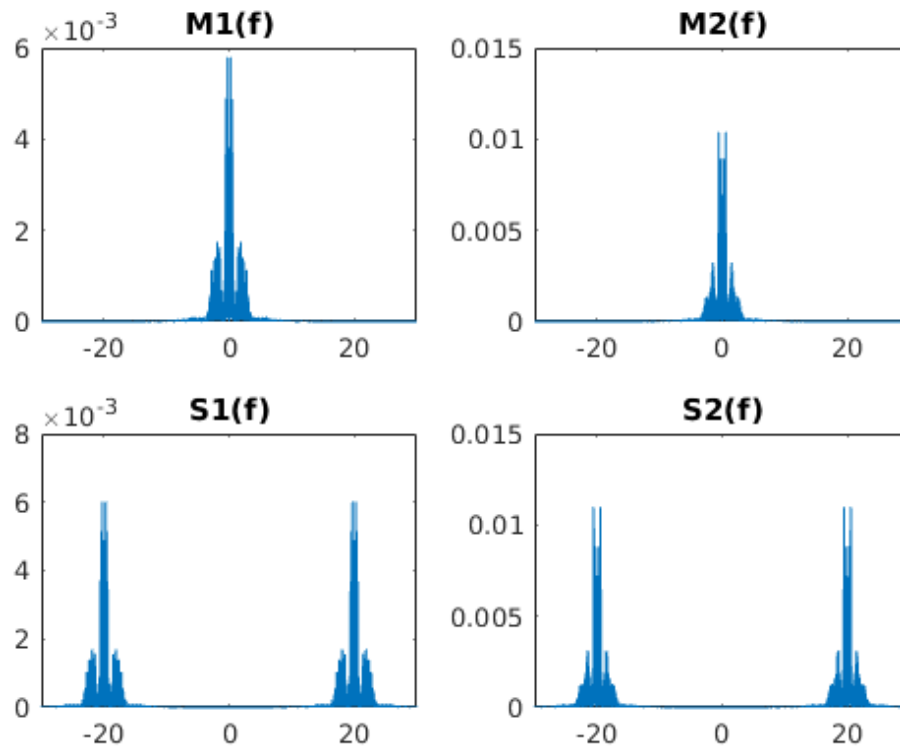
---

```

%title('Sinal |M(f)|')
title('S1(f)')

%i)|S2(f)|
subplot(2,2,4)
plot(f,S2)
xlim([-30 30])
title('S2(f)')

```



## 2 - a)

```

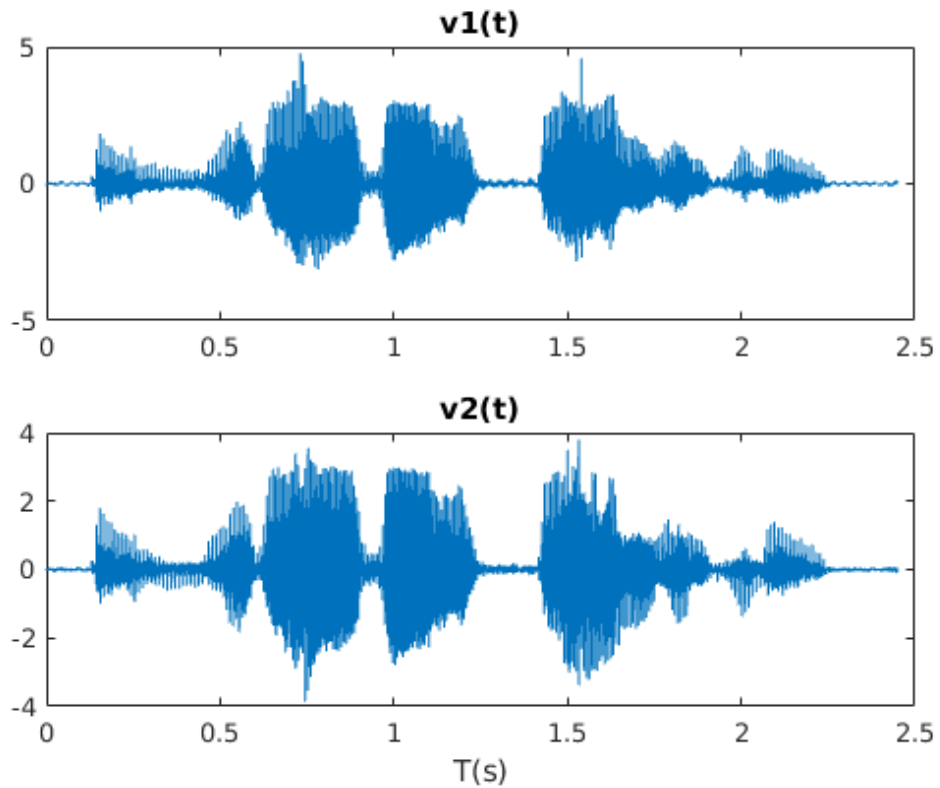
s = s1 + s2;

v1 = s.*2.*cos(2*pi*fc.*t);
v2 = s.*2.*sin(2*pi*fc.*t);

figure(3);
subplot(2,1,1);
plot(t,v1);
%xlim([-30 30]);
title('v1(t)');

subplot(2,1,2);
plot(t,v2);
%xlim([-30 30]);
title('v2(t)');
xlabel('T(s)');

```



## 2 - b)

```
fcorte = 6000/(fs/2);
h = fir1(2000,fcorte);
[H, fh] = freqz(h,1,N/2+1,fs/1000) ;
H = abs(H);
vo1 = filter(h,1,v1);
vo2 = filter(h,1,v2);
```

## 2 - c)

```
S = abs(fftshift(fft(s)))/N;

V1 = abs(fftshift(fft(v1)))/N;
V2 = abs(fftshift(fft(v2)))/N;
Vo1 = abs(fftshift(fft(vo1)))/N;
Vo2 = abs(fftshift(fft(vo2)))/N;

figure(4)

subplot(5,1,1)
plot(f,S);
xlim([0 50]);
title(' |S(f)| ');
```

---

```

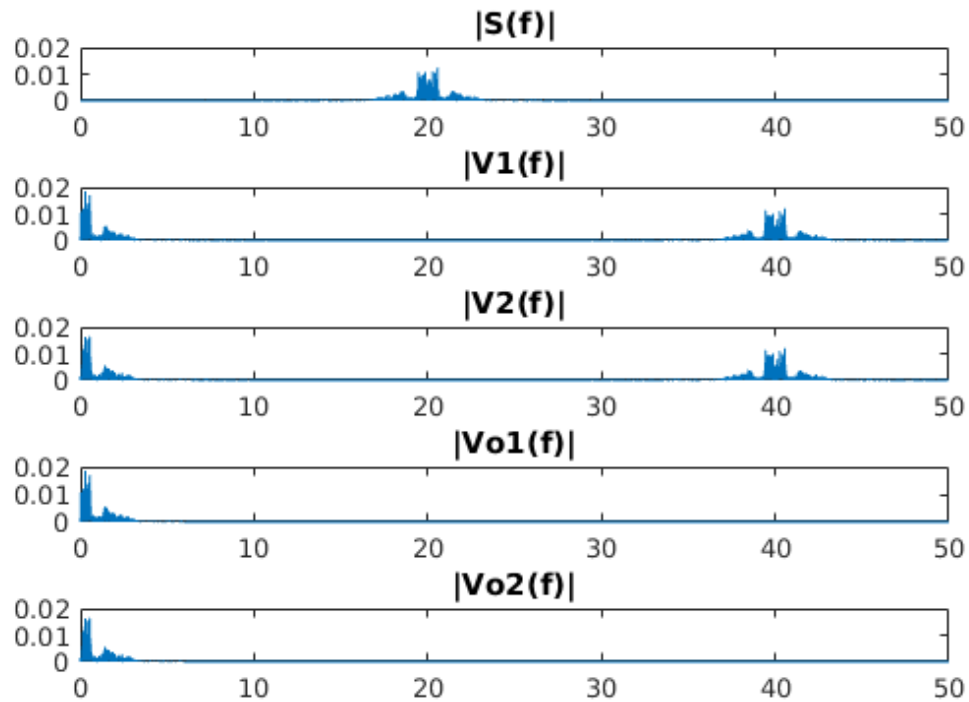
subplot(5,1,2)
plot(f,V1);
xlim([0 50]);
title(' |V1(f)| ');

subplot(5,1,3)
plot(f,V2);
xlim([0 50]);
title(' |V2(f)| ');

subplot(5,1,4)
plot(f,Vo1);
xlim([0 50]);
title(' |Vo1(f)| ');

subplot(5,1,5)
plot(f,Vo2);
xlim([0 50]);
title(' |Vo2(f)| ');

```



## 2 - d)

```

% Com uma análise gráfica, aparentemente ficaram iguais,
% respectivamente.
%sound(m1,fs)
%sound(m2,fs)

```

---

```
%sound(vol,fs)
sound(vo2,fs)

% Os áudios estão encavalados , vol e vo2.
% Ocorre porque houve perda de sincronismo de fase
% Sim, este evento está relacionado à equação (1), pois a fase foi
alterada
% nesta questão.
```

*Published with MATLAB® R2017a*