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Id: 20-42195-1

Course Name: Data Communication

Section: D

Lab Report Number: 07

Semester: 2021-2022 Fall

Submission Date: 22-11-2021

Lab Performance Task

ID = AB-CDEFG-H

Here, my id is: 20-42195-1

A = 2, B = 0, C = 4, D = 2, E = 1, F = 9, G = 5, H = 1

Code:

```
clc

clear all

close all

F=9;

G=5;

fs = 4001;

t = 0:1/fs:1-1/fs;

am1 = F+2;

fm1 = (G+1);

mt1 = am1*cos(2*pi*fm1*t);

am2 = (F+5);

fm2 = (G+2);

mt2 = am2*cos(2*pi*fm2*t);

am3 = (F+8);

fm3 = (G+3);

mt3 = am3*cos(2*pi*fm3*t);

am4 = (F+11);

fm4 = (G+4);

mt4 = am4*cos(2*pi*fm4*t);
```

```
Cmt1 = 1;

fc1 = 56;

c1 = Cmt1*cos(2*pi*fc1*t);

Cmt2 = 1;

fc2 = 132;

c2 = Cmt2*cos(2*pi*fc2*t);

Cmt3 = 1;

fc3 = 176;

c3 = Cmt3*cos(2*pi*fc3*t);

Cmt4 = 1;

fc4 = 240;

c4 = Cmt4*cos(2*pi*fc4*t);

x = (mt1).*c1+(mt2).*c2+(mt3).*c3+(mt4).*c4;

figure

subplot(4,1,1)

plot(t,mt1)

xlabel('time')

ylabel('amplitude')

title('Message signal 1 in time domain')

ylim([-am1 am1])

subplot(4,1,2)

plot(t,mt2)

xlabel('time')

ylabel('amplitude')

title('Message signal 2 in time domain')
```

```
ylim([-am2 am2])
subplot(4,1,3)
plot(t,mt3)
xlabel('time')
ylabel('amplitude')
title('Message signal 3 in time domain')
ylim([-am3 am3])
subplot(4,1,4)
plot(t,mt3)
xlabel('time')
ylabel('amplitude')
title('Message signal 4 in time domain')
ylim([-am4 am4])
M1 = abs(fftshift(fft(mt1)))/(fs/2);
M2 = abs(fftshift(fft(mt2)))/(fs/2);
M3 = abs(fftshift(fft(mt3)))/(fs/2);
M4 = abs(fftshift(fft(mt4)))/(fs/2);
X = abs(fftshift(fft(x)))/(fs/2);
f = fs/2*linspace(-1,1,fs);
figure
subplot(4,1,1)
stem(f,M1)
xlabel('frequency')
ylabel('amplitude')
title('Message signal 1 in frequency domain')
```

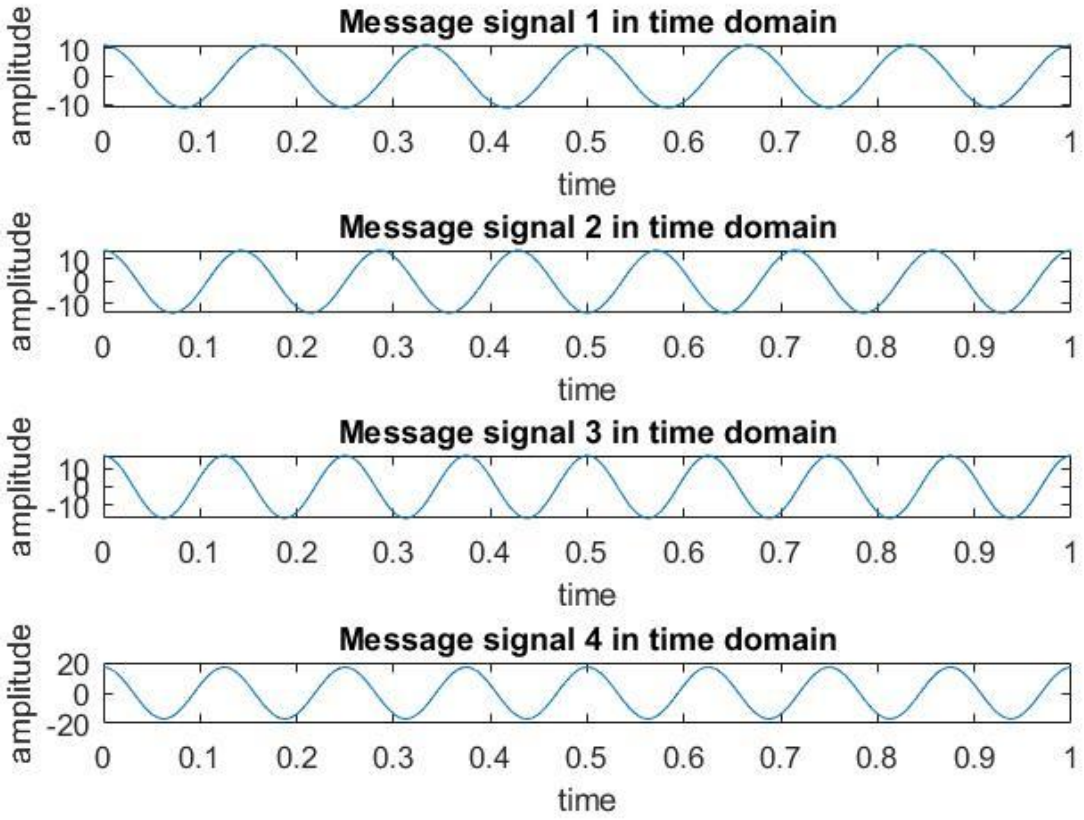
```
axis([-10 10 0 2.5])
subplot(4,1,2)
stem(f,M2)
xlabel('frequency')
ylabel('amplitude')
title('Message signal 2 in frequency domain')
axis([-10 10 0 3.5])
subplot(4,1,3)
stem(f,M3)
xlabel('frequency')
ylabel('amplitude')
title('Message signal 3 in frequency domain')
axis([-10 10 0 4.5])
subplot(4,1,4)
stem(f,M4)
xlabel('frequency')
ylabel('amplitude')
title('Message signal 4 in frequency domain')
axis([-10 10 0 5.5])
figure
subplot(2,1,1)
plot(t,x)
xlabel('time')
ylabel('amplitude')
title('Composite signal in time domain')
```

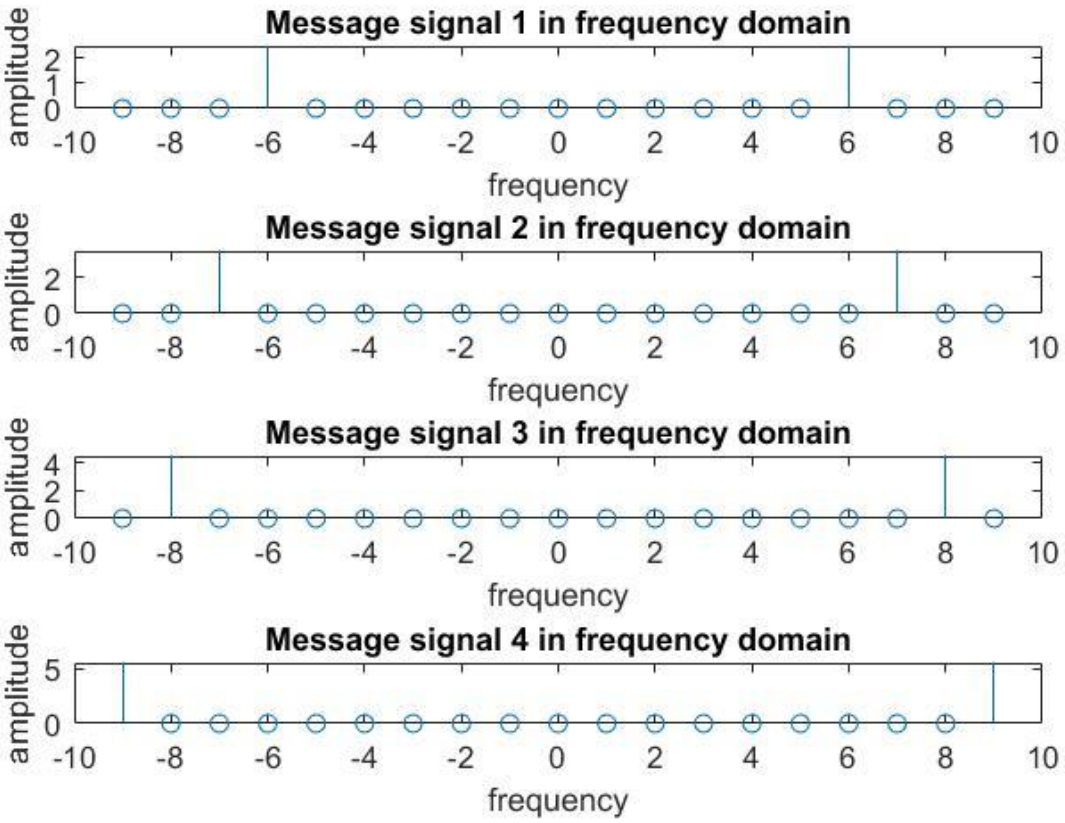
```
subplot(2,1,2)
stem(f,X)
xlabel('frequency')
ylabel('amplitude')
title('Composite signal in frequency domain')
axis([-270 270 0 8])
[num1, den1] = butter(5, [(fc1-fm1-6)/(fs/2),(fc1+fm1+6)/(fs/2)]);
bpf1 = filter(num1,den1,x);
[num2, den2] = butter(5, [(fc2-fm2-6)/(fs/2),(fc2+fm2+6)/(fs/2)]);
bpf2 = filter(num2,den2,x);
[num3, den3] = butter(5, [(fc3-fm3-6)/(fs/2),(fc3+fm3+6)/(fs/2)]);
bpf3 = filter(num3,den3,x);
[num4, den4] = butter(5, [(fc4-fm4-6)/(fs/2),(fc4+fm4+6)/(fs/2)]);
bpf4 = filter(num4,den4,x);
z1 = 2*bpf1.*c1;
z2 = 2*bpf2.*c2;
z3 = 2*bpf3.*c3;
z4 = 2*bpf4.*c4;
[num5, den5] = butter(5, (fm1+3)/(fs/2));
rec1 = filter(num5,den5,z1);
[num6, den6] = butter(5, (fm2+3)/(fs/2));
rec2 = filter(num6,den6,z2);
[num7, den7] = butter(5, (fm3+3)/(fs/2));
rec3 = filter(num7,den7,z3);
[num8, den8] = butter(5, (fm4+3)/(fs/2));
```

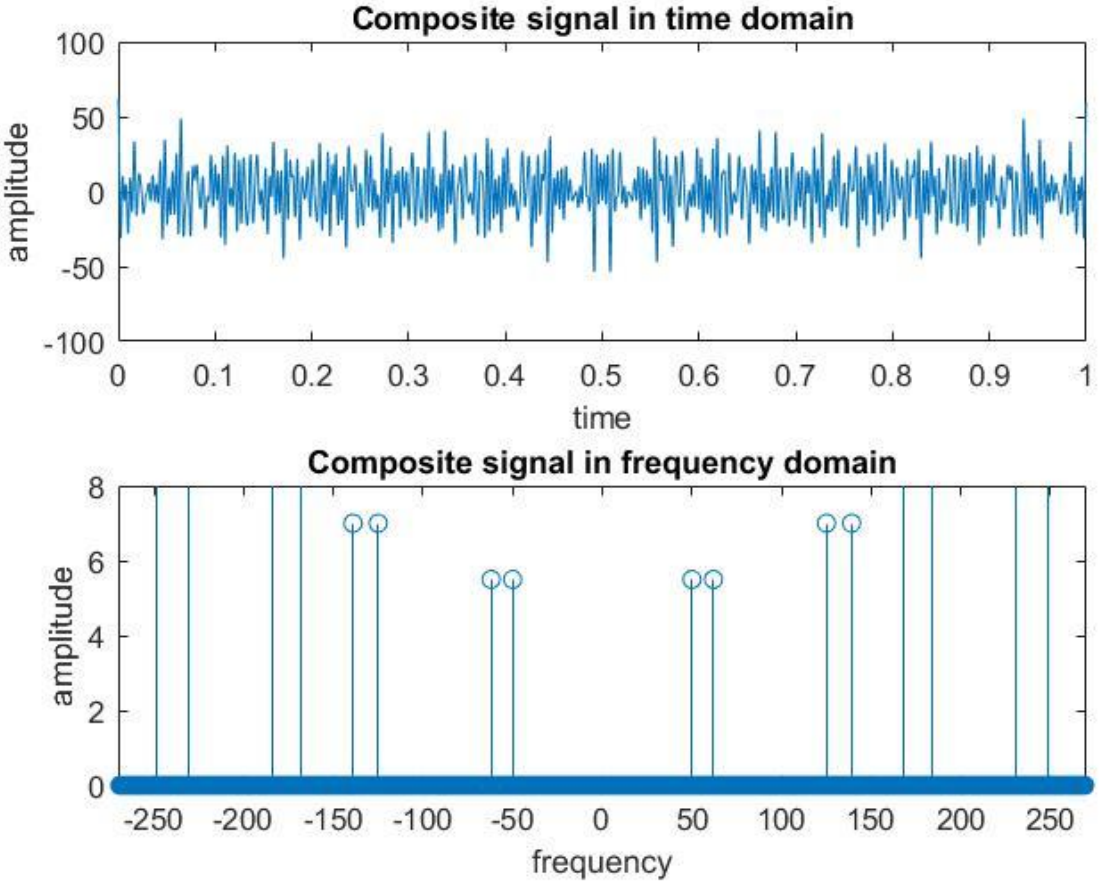
```
rec4 = filter(num8,den8,z4);
figure
subplot(4,1,1)
plot(t,rec1)
xlabel('time')
ylabel('amplitude')
title('Received signal 1 in time domain')
ylim([-am1 am1])
subplot(4,1,2)
plot(t,rec2)
xlabel('time')
ylabel('amplitude')
title('Received signal 2 in time domain')
ylim([-am2 am2])
subplot(4,1,3)
plot(t,rec3)
xlabel('time')
ylabel('amplitude')
title('Received signal 3 in time domain')
ylim([-am3 am3])
subplot(4,1,4)
plot(t,rec4)
xlabel('time')
ylabel('amplitude')
title('Received signal 4 in time domain')
```

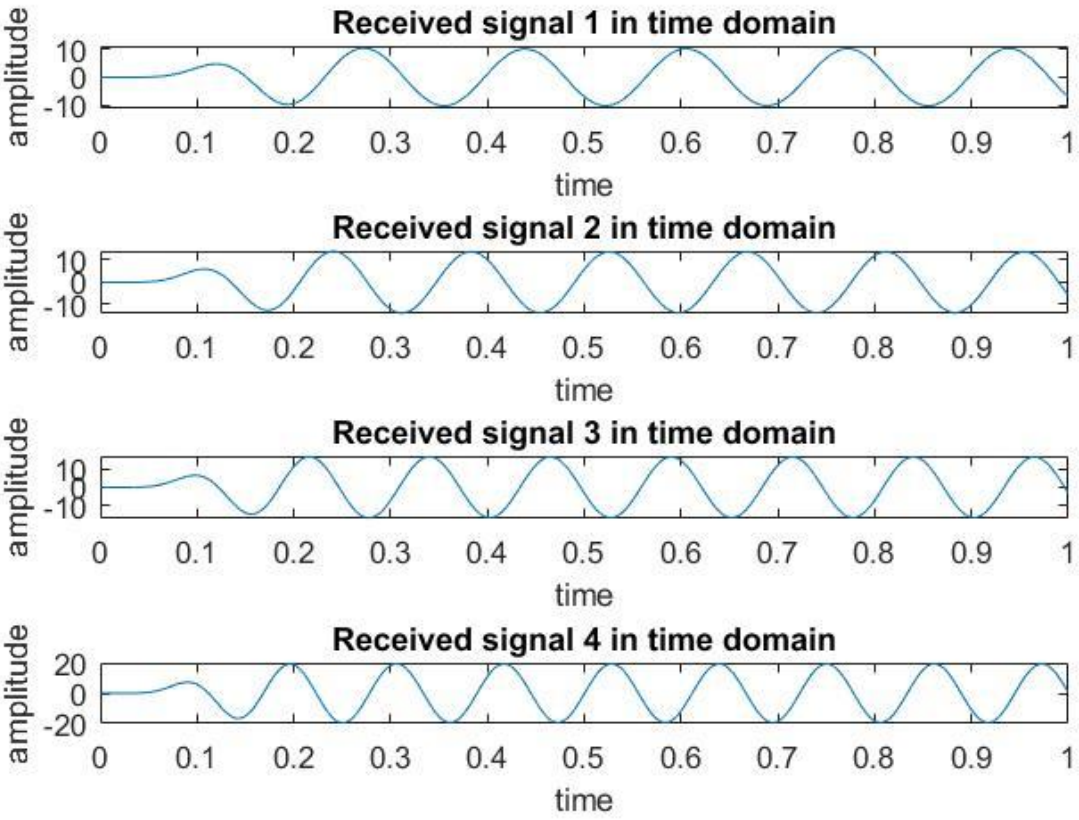
```
ylim([-am4 am4])
R1 = abs(fftshift(fft(rec1)))/(fs/2);
R2 = abs(fftshift(fft(rec2)))/(fs/2);
R3 = abs(fftshift(fft(rec3)))/(fs/2);
R4 = abs(fftshift(fft(rec4)))/(fs/2);
figure
subplot(4,1,1)
stem(f,R1)
xlabel('frequnecy')
ylabel('amplitude')
title('Received signal 1 in frequency domain')
xlim([-10 10])
subplot(4,1,2)
stem(f,R2)
xlabel('frequnecy')
ylabel('amplitude')
title('Received signal 2 in frequency domain')
xlim([-10 10])
subplot(4,1,3)
stem(f,R3)
xlabel('frequnecy')
ylabel('amplitude')
title('Received signal 3 in frequency domain')
xlim([-10 10])
subplot(4,1,4)
```

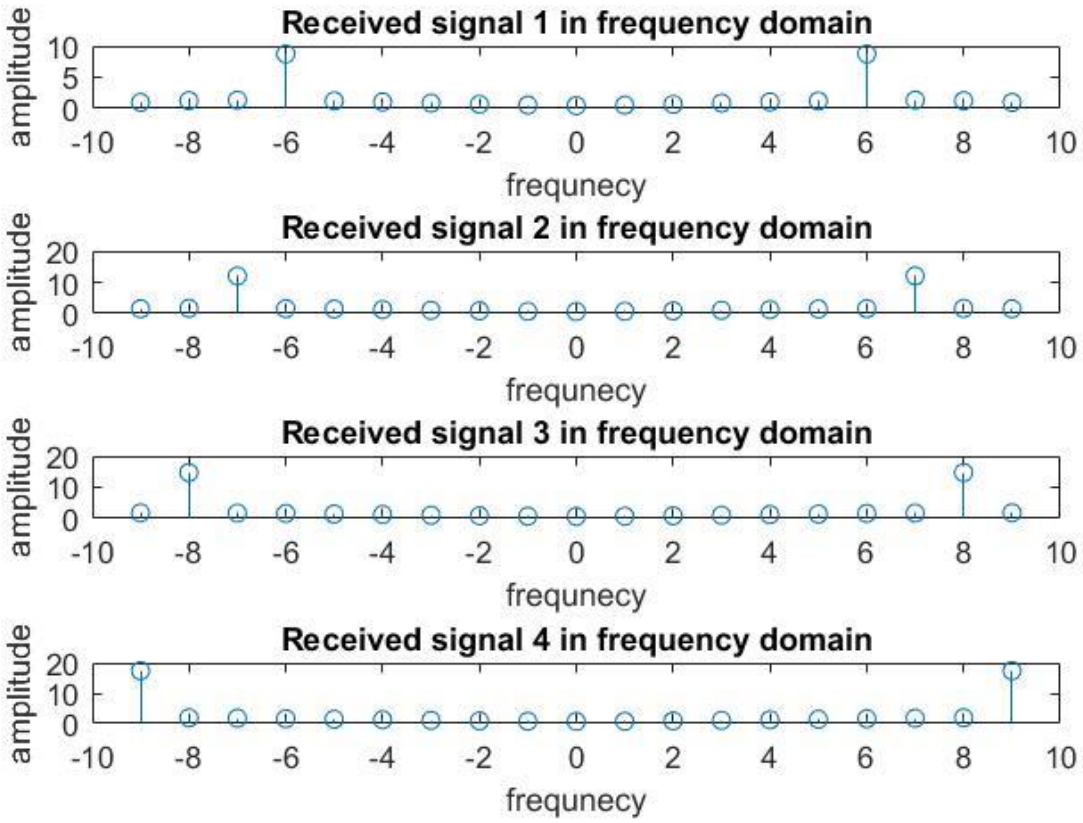
```
stem(f,R4)
xlabel('frequnecy')
ylabel('amplitude')
title('Received signal 4 in frequency domain')
xlim([-10 10])
```




Message signal 1 in frequency domain
amplitude
2
1
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
frequency
Message signal 2 in frequency domain
amplitude
2
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
frequency
Message signal 3 in frequency domain
amplitude
4
2
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
frequency
Message signal 4 in frequency domain
amplitude
5
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
frequency


Composite signal in time domain
amplitude
time
Composite signal in frequency domain
amplitude
frequency


Received signal 1 in time domain
amplitude
10
0
-10
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
time
Received signal 2 in time domain
amplitude
10
0
-10
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
time
Received signal 3 in time domain
amplitude
10
0
-10
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
time
Received signal 4 in time domain
amplitude
20
0
-20
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
time



Discussion:

There is some of the bugs concluded with the definite organizational complementation with the functions of the MATLAB. The regression of the functions originated from the libraries inclines the comprehensive objective of this complementation. I face some problems while creating the plot and also face problems while calculation using my student id number. MATLAB takes some time while I try to run because my laptop configuration is low.