AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Science & Technology

Undergraduate Program

Course: DATA COMMUNICATION

Fall 2022-23

Section:I

Group: 3

Lab Report-02

Submitted by

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Performance Task for Lab Report: (your ID = AB-CDEFG-H)

**Generate a composite signal using three simple signals as,

x1 = a1*cos(2*pi*f1*t), x2 = a2*sin(2*pi*f2*t), x3 = a3*cos(2*pi*f3*t)

signal_x = x1 + x2 + x3

Select the values of the amplitude and frequency as follows: a1 = G + 1, a2 = F + 2, a3 = E + 3,

f1 = E + 1, f2 = F + 2, f3 = G + 3.

(a) Show time domain and frequency domain representations of **signal_x** in a single figure

window using subplot. Use **axis**, or **xlim**, or **ylim** to appropriately represent the signal.

(b) Quantize **signal_x** in 4 equally distributed levels and provide image for **one cycle** of the

original signal and quantized signal. Use **axis**, or **xlim**, or **ylim** to appropriately represent the

signal. [Use **quantiz()** function]

(c) Quantize **signal_x** in 8 equally distributed levels and provide image for **one cycle** of the

original signal and quantized signal. Use **axis**, or **xlim**, or **ylim** to appropriately represent the

signal. [Do not use **quantiz()** function]

Answer to the question number (a)

```
%20-42556-1
clc
close all
A=2;
B=0;
C=4;
D=2;
E=5;
F=5;
G=6;
H=1;
a1=G+1;
a2=F+2;
a3=E+3;
f1=E+1;
f2=F+2;
f3=G+3;
fs=5000;
t=0:1/fs:5;
x1=a1*cos(2*pi*f1*t);
x2=a2*sin(2*pi*f2*t);
x3=a3*cos(2*pi*f3*t);
subplot(2,1,1);
signal_x = x1 + x2 + x3 ;
plot(t,signal_x)
xlabel('time');
ylabel('amplitude');
title('Time Domain')
subplot(2,1,2);
signal_x = x1 + x2 + x3;
sig_freq=abs(fftshift(fft(signal_x)))/(length(signal_x)/2);
f=linspace(-fs/2,+fs/2,length(signal_x));
bar(f,sig_freq)
xlim([-15,+15])
ylim([0,+10])
xlabel('Frequency');
ylabel('amplitude');
title('Frequency Domain')
sd=10;
noise=sd*randn(size(signal_x));
```

```
figure
subplot(2,1,1);
plot(t,noise,'linewidth',1)
xlabel('Time');
ylabel('amplitude');
title('Time Domain')

subplot(2,1,2);
noise_s=abs(fftshift(fft(noise)))/(length(signal_x)/2);
bar(f,noise_s)
xlim([-15,+15])
xlabel('Frequency');
ylabel('amplitude');
title('Frequency Domain')
noise_sa= signal_x + noise;
figure
subplot(2,1,1);
plot(t,noise_sa, 'linewidth',2);
xlabel('time');
ylabel('amplitude');
title('Noise signal vs time domain');



noise_sf=abs(fftshift(fft(noise_sa)))/(length(signal_x)/2);
subplot(2,1,2);
bar(f,noise_sf, 'linewidth',2);
xlim([-15,+15])
xlabel('frequency');
ylabel('amplitude');
title('frequency domain Noise signal');
```

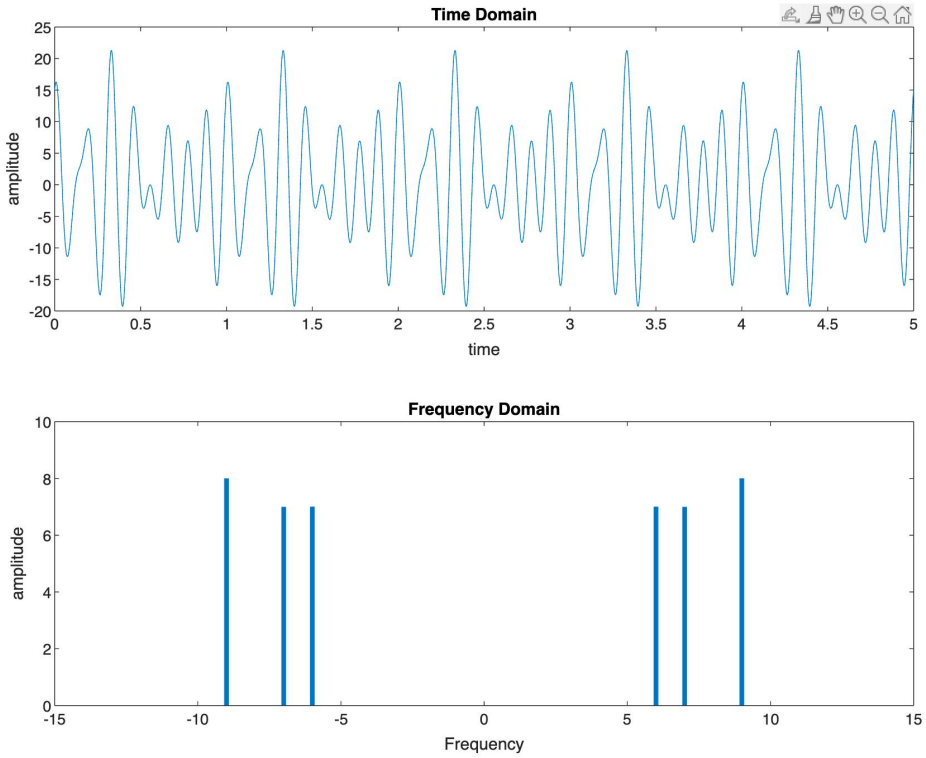


Figure :a

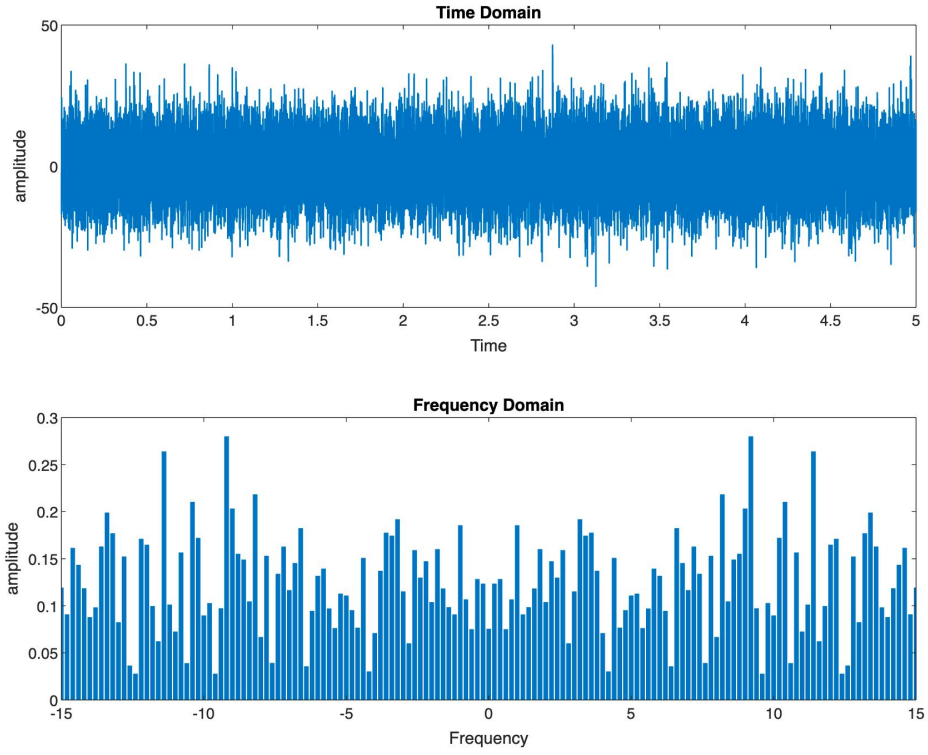
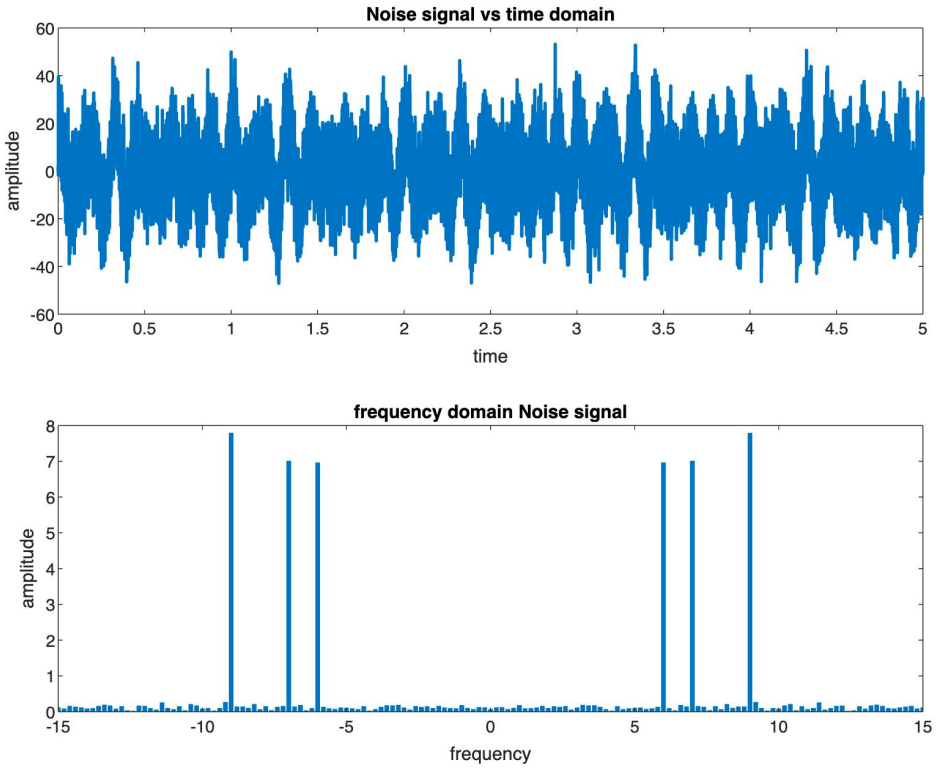


Figure :b


Noise signal vs time domain
amplitude
time
60
40
20
0
-20
-40
-60
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

frequency domain Noise signal
amplitude
frequency
8
7
6
5
4
3
2
1
0
-15
-10
-5
0
5
10
15

Figure :c