



# American International University – Bangladesh (AIUB)

## Department of Computer Science And Engineering

### LAB REPORT COVER PAGE

Course Name	DATA COMMUNICATION
Lab Report No	04
Lecturer Name	ABIR AHMED
Semester	SUMMER 2020-2021
Submission Date	20/6/2021
Section	C
Group No.	

Student Name	ID	Contribution(out of 100%)
MD. NAIMUL HOSSAIN	19-39513-1	100%

Lecturer Remarks (Only for teacher)	
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### QUESTION

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

\*\*Generate a composite signal using two simple signals as,

$$x = A1 \sin(2\pi(C*100)t) + A2 \cos(2\pi(G*100)t) + s*\text{randn}(\text{size}(t));$$

- Select the value of the amplitudes as follows: let  $A1 = AB$ ,  $A2 = AF$  and  $s=AH$
- Calculate the SNR value of the composite signal.
- Find the bandwidth of the signal and calculate the maximum capacity of the channel.
- What will be the signal level to achieve the data rate

## LAB REPORT 4




MY Id is 19-39513-1.

1 9 - 3 9 5 1 3 - 1  
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓  
A B C D E F G H

So,  $A_1 = AB = 19$ ,  $A_2 = AF = 11$ ,  $s = AH = 11$

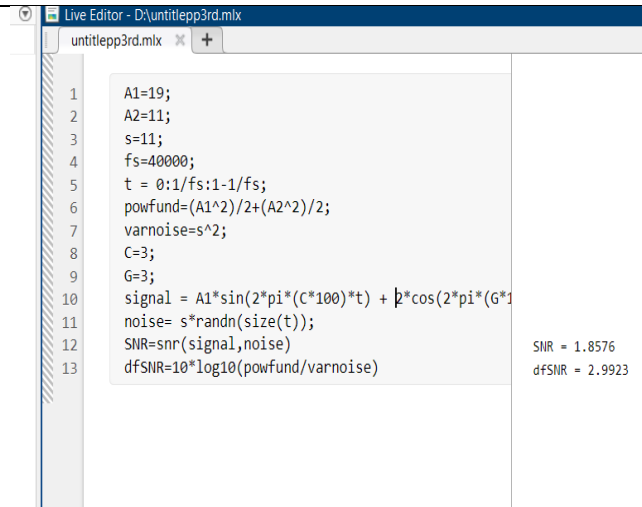
(a)

```
A1=19;  
A2=11;  
s=11;
```

Workspace			Command Window
Name ^		Value	
	A1	19	
	A2	11	
	s	11	

**(b)**

```
A1=19;
A2=11;
s=11;
fs=40000;
t = 0:1/fs:1-1/fs;
powfund=(A1^2)/2+(A2^2)/2;
varnoise=s^2;
C=3;
G=3;
signal =
A1*sin(2*pi*(C*100)*t)2*cos(2*pi*(G*100)*t);
noise= s*randn(size(t));
SNR=snr(signal,noise)
dfSNR=10*log10(powfund/varnoise)
```



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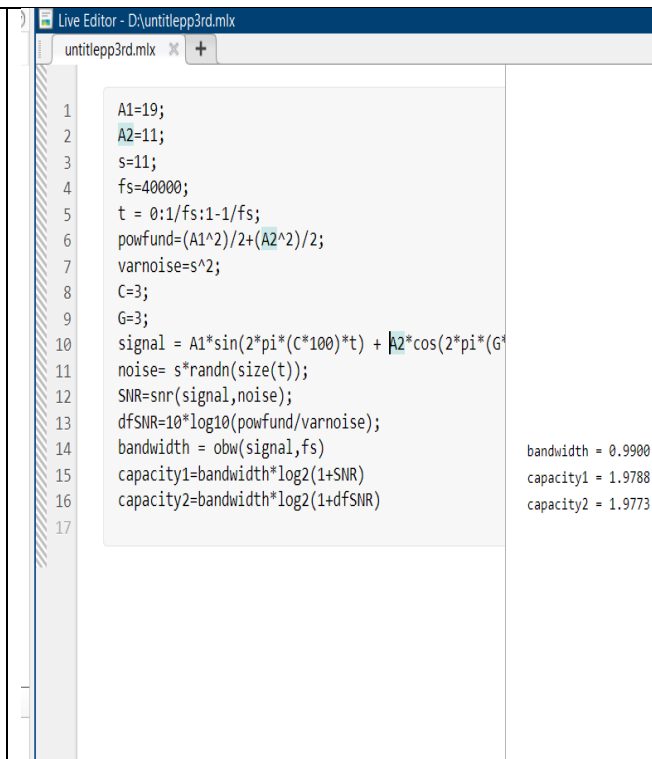
untitledpp3rd.mlx

```
1 A1=19;
2 A2=11;
3 s=11;
4 fs=40000;
5 t = 0:1/fs:1-1/fs;
6 powfund=(A1^2)/2+(A2^2)/2;
7 varnoise=s^2;
8 C=3;
9 G=3;
10 signal = A1*sin(2*pi*(C*100)*t) + 2*cos(2*pi*(G*100)*t);
11 noise= s*randn(size(t));
12 SNR=snr(signal,noise)
13 dfSNR=10*log10(powfund/varnoise)
```

SNR = 1.8576  
dfSNR = 2.9923

**(c)**

```
A1=19;
A2=11;
s=11;
fs=40000;
t = 0:1/fs:1-1/fs;
powfund=(A1^2)/2+(A2^2)/2;
varnoise=s^2;
C=3;
G=3;
signal =
A1*sin(2*pi*(C*100)*t) +
A2*cos(2*pi*(G*100)*t);
noise= s*randn(size(t));
SNR=snr(signal,noise);
dfSNR=10*log10(powfund/varnoi
se);
bandwidth = obw(signal,fs)
capacity1=bandwidth*log2(1+SN
R)
capacity2=bandwidth*log2(1+df
SNR)
```



Live Editor - D:\untitledpp3rd.mlx

untitledpp3rd.mlx

```
1 A1=19;
2 A2=11;
3 s=11;
4 fs=40000;
5 t = 0:1/fs:1-1/fs;
6 powfund=(A1^2)/2+(A2^2)/2;
7 varnoise=s^2;
8 C=3;
9 G=3;
10 signal = A1*sin(2*pi*(C*100)*t) + A2*cos(2*pi*(G*100)*t);
11 noise= s*randn(size(t));
12 SNR=snr(signal,noise);
13 dfSNR=10*log10(powfund/varnoise);
14 bandwidth = obw(signal,fs)
15 capacity1=bandwidth*log2(1+SNR)
16 capacity2=bandwidth*log2(1+dfSNR)
17
```

bandwidth = 0.9900  
capacity1 = 1.9788  
capacity2 = 1.9773

(d)

```
A1=19;
A2=11;
s=11;
fs=40000;
t = 0:1/fs:1-1/fs;
powfund=(A1^2)/2+(A2^2)/2;
varnoise=s^2;
C=3;
G=3;
signal = A1*sin(2*pi*(C*100)*t) +
A2*cos(2*pi*(G*100)*t);
noise= s*randn(size(t));
SNR=snr(signal,noise);
dfSNR=10*log10(powfund/varnoise);
bandwidth = obw(signal,fs);
capacity1=bandwidth*log2(1+SNR);
capacity2=bandwidth*log2(1+dfSNR);
apprxDataRate1=floor(bandwidth*log
2(1+SNR));
apprxDataRate2=floor(bandwidth*log
2(1+dfSNR));
level1=floor(2^(apprxDataRate1/(2*
bandwidth)))
level2=floor(2^(apprxDataRate2/(2*
bandwidth)))
```

```
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untitled3rd.mlx
1 A1=19;
2 A2=11;
3 s=11;
4 fs=40000;
5 t = 0:1/fs:1-1/fs;
6 powfund=(A1^2)/2+(A2^2)/2;
7 varnoise=s^2;
8 C=3;
9 G=3;
10 signal = A1*sin(2*pi*(C*100)*t) + A2*cos(2*pi*(G*100)*t);
11 noise= s*randn(size(t));
12 SNR=snr(signal,noise);
13 dfSNR=10*log10(powfund/varnoise);
14 bandwidth = obw(signal,fs);
15 capacity1=bandwidth*log2(1+SNR);
16 capacity2=bandwidth*log2(1+dfSNR);
17 apprxDataRate1=floor(bandwidth*log2(1+SNR));
18 apprxDataRate2=floor(bandwidth*log2(1+dfSNR));
19 level1=floor(2^(apprxDataRate1/(2*bandwidth)))
20 level2=floor(2^(apprxDataRate2/(2*bandwidth)))
21
level1 = 1
level2 = 1
```