AMERICAN INTERNATIONAL UNIVERSITY – BANGLADESH

FACULTY OF SCIENCE & TECHNOLOGY

Course Title: Data Communication

Lab Report-4

Submitted by:

NAME: ABU SHALEH MD. KAIUM

SECTION: G

ID: 20-42475-1

DATE OF SUBMISSION: 15/03/2022

PROGRAM: BSc CSE

COURSE TITLE: Data Communication

Submitted to:

Course Teacher: Tanjil Amin

Class Work:

Our composite signal is,

signal =

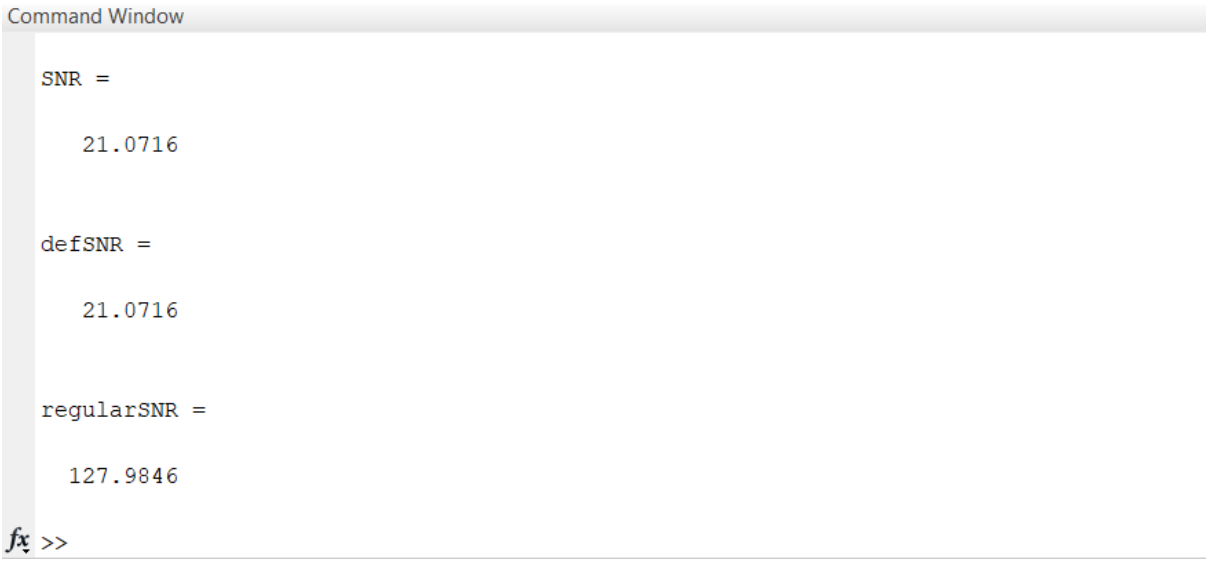
1.5*sin(2*pi*2*t)+0.9*cos(2*pi*10*t)+1.1*sin(2*pi*20*t)+0.13*randn(size(t));

*****Calculate the SNR value of the signal.

Matlab Code:

```
fs = 8000; % Sampling frequency
t = 0:1/fs:1-1/fs; %time array
signal = 1.5*sin(2*pi*2*t)+0.9*cos(2*pi*10*t)+1.1*sin(2*pi*20*t) ;
noise = 0.13*randn(size(t));
noisy_signal = signal+noise;
power_signal = sum(signal.^2)/length(signal);
power_noise = sum(noise.^2)/length(noise);
SNR = snr(signal,noise)
defSNR = 10*log10(power_signal/power_noise)
regularSNR = 10^(SNR/10)
```

Output:



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

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

x = A1 sin(2π((C+D+H)*100)t) + A2 cos(2π((D+E+H)*100)t) + s*randn(size(t));

(a) Select the value of the amplitudes as follows: let A1 = (A+B+H), A2 = (B+C+H) and s = (C+D+H)/30

(b) Calculate the SNR value of the composite signal.

(c) Find the bandwidth of the signal and calculate the maximum capacity of the channel.

Matlab Code:

```
A=2;
B=0;
C=4;
D=2;
E=4;
F=7;
G=5;
H=1;
%(a)
A1=A+B+H;
A2=B+C+H;
s=(C+D+H)/30;
fs= 5000;% sampling freqency
t= 0:1/fs:1-1/fs;%time array
signal = A1*sin(2*pi*((C+D+H)*100)*t ) + A2*cos(2*pi*((D+E+H)*100)*t) ;
noise = s*randn(size(t));
x = signal+noise;
%(b)
power_signal = sum(signal.^2)/length(signal);
power_noise = sum(noise.^2)/length(noise);

SNR_dB= snr(signal,noise);
```

```
regularSNR= power_signal/power_noise;


regularSNR2=10^(SNR_dB/10);
%(c)
bandwith=obw(signal ,fs);
max_capacity = bandwith*log2(1 + regularSNR);
%(d)
level = floor(2^(1/2*log2(1 + regularSNR)));
```

Output:

```
>> max_capacity

max_capacity =

    8.2279

>> level

level =

    17

>>
```