American International University-Bangladesh (AIUB)

Department of Computer Engineering

COE 3201: Data Communication Laboratory

Lab Report 3

Title: Study of Nyquist bit rate and Shannon capacity using MATLAB

Supervised By

SADMAN SHAHRIAR ALAM

Submitted By

Name	ID
MD. JOBAER HOSSAIN	22-47116-1

Group Members

Name	ID
RIFAH SANZIDA	22-47154-1
MD SAMIN YEASAR	22-47139-1
SHAYAN ABRAR	22-47156-1

Ans the questions

ID: AB-CDEFG-H
ID: 22-47116-1

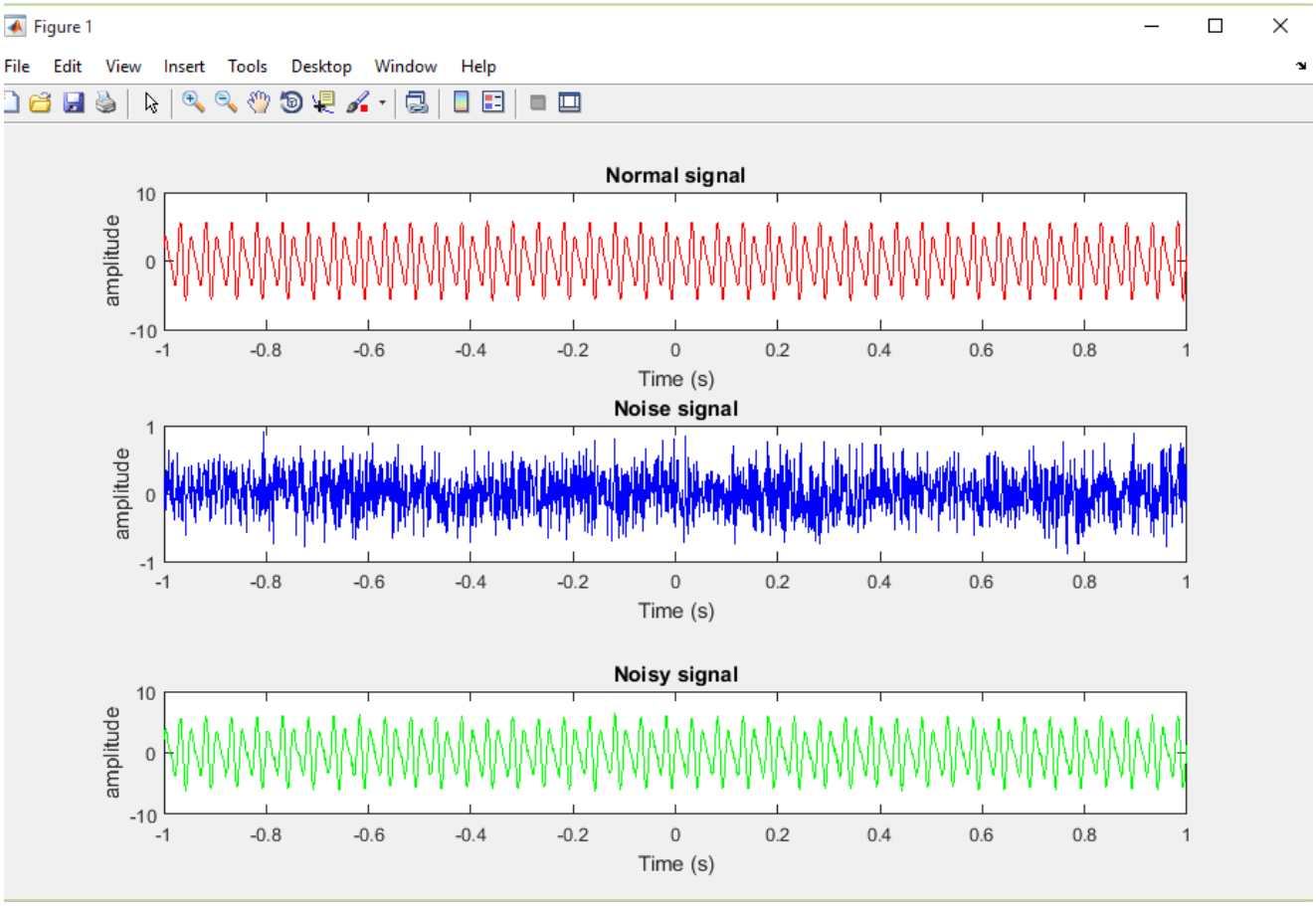
a

A1=A*B=2*2=4

A2=A*F=2*1=2

S=A*H=2*1=2

```
t = -1:0.001:1-1/fs; % Time duration
f1 = 40; % Frequency of first signal
f2 = 20; % Frequency of second signal
A1 = 4; % Amplitude of first signal
A2 = 2; % Amplitude of second signal
s=0.3;
x = A1*sin(2*pi*40*t ) + A2*cos(2*pi*60*t); % First Signal\
n=s*randn(size(x));

ns=x+n;

SNR = snr(ns)

subplot(3,1,1)
plot(t,x,'R')
title('Normal signal');
xlabel('Time (s)');
ylabel('amplitude');

subplot(3,1,2)
plot(t,n,'B')
title('Noise signal');
xlabel('Time (s)');
ylabel('amplitude');

subplot(4,1,4)
plot(t,ns,'G');
title('Noisy signal');
xlabel('Time (s)');
ylabel('amplitude');

bandwidth = obw(ns,fs) % Bandwidth of the signal
Max_Capacity=bandwidth*log2(1+SNR)
BitRate = Max_Capacity
```



b

```
t = -1:0.001:1-1/fs; % Time duration
f1 = 40; % Frequency of first signal
f2 = 20; % Frequency of second signal
A1 = 4; % Amplitude of first signal
A2 = 2; % Amplitude of second signal
s=0.3;
x = A1*sin(2*pi*40*t ) + A2*cos(2*pi*60*t); % First Signal\
n=s*randn(size(x));

ns=x+n;

SNR = snr(ns)
```

```
SNR =

    5.9081
```

c

```
t = -1:0.001:1-1/fs; % Time duration
f1 = 40; % Frequency of first signal
f2 = 20; % Frequency of second signal
A1 = 4; % Amplitude of first signal
A2 = 2; % Amplitude of second signal
s=0.3;
x = A1*sin(2*pi*40*t ) + A2*cos(2*pi*60*t); % First Signal\
n=s*randn(size(x));

ns=x+n;
bandwidth = obw(ns,fs) % Bandwidth of the signal
Max_Capacity=bandwidth*log2(1+SNR)
```

```
bandwidth =

    1.9309e+03


Max_Capacity =

    5.3838e+03
```

d

```
t = -1:0.001:1-1/fs; % Time duration
f1 = 40; % Frequency of first signal
f2 = 20; % Frequency of second signal
A1 = 4; % Amplitude of first signal
A2 = 2; % Amplitude of second signal
s=0.3;
x = A1*sin(2*pi*40*t ) + A2*cos(2*pi*60*t); % First Signal\
n=s*randn(size(x));

ns=x+n;
bandwidth = obw(ns,fs) % Bandwidth of the signal
Max_Capacity=bandwidth*log2(1+SNR)
BitRate = Max_Capacity
```

```
BitRate =

    5.3838e+03
```