



American International University-Bangladesh

Data Communication

Section: **H**

Experiment-03

Experiment name: Study of Nyquist bit rate and Shannon capacity using MATLAB.

Submitted by-

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Performance:1

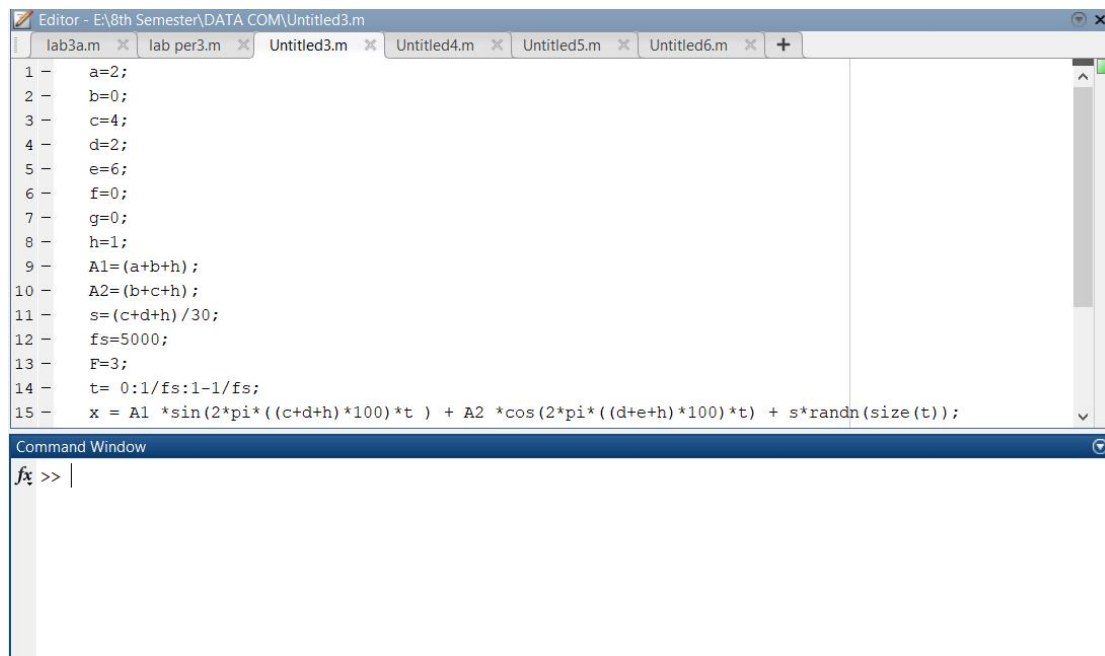
(a)

```
a=2;
b=0;
c=4;
d=2;
e=6;
f=0;
g=0;
h=1;
A1=(a+b+h);
A2=(b+c+h);
s=(c+d+h)/30;
fs=5000;
F=3;
t= 0:1/fs:1-1/fs;
x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) +
s*randn(size(t));
bandwidth = obw(x,fs);
```

SNR = snr(x)

C = bandwidth*log2(1+SNR)

L= 2^(450/(2*bandwidth))



The screenshot shows a MATLAB editor window with the following code in the Untitled3.m file:

```
1 - a=2;
2 - b=0;
3 - c=4;
4 - d=2;
5 - e=6;
6 - f=0;
7 - g=0;
8 - h=1;
9 - A1=(a+b+h);
10 - A2=(b+c+h);
11 - s=(c+d+h)/30;
12 - fs=5000;
13 - F=3;
14 - t= 0:1/fs:1-1/fs;
15 - x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) + s*randn(size(t));
```

Below the editor is a Command Window with the prompt `fx >> |`.

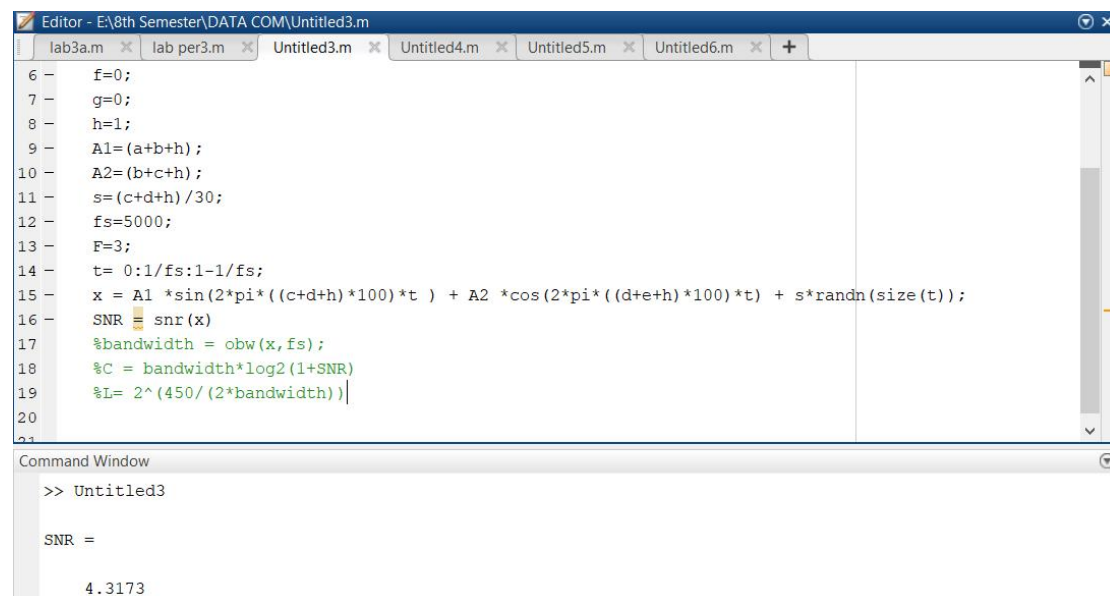
(b)

```
a=2;
b=0;
```

```

c=4;
d=2;
e=6;
f=0;
g=0;
h=1;
A1=(a+b+h);
A2=(b+c+h);
s=(c+d+h)/30;
fs=5000;
F=3;
t= 0:1/fs:1-1/fs;
x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) +
s*randn(size(t));
SNR = snr(x)

```



Editor - E:\8th Semester\DATA COM\Untitled3.m

```

6 - f=0;
7 - g=0;
8 - h=1;
9 - A1=(a+b+h);
10 - A2=(b+c+h);
11 - s=(c+d+h)/30;
12 - fs=5000;
13 - F=3;
14 - t= 0:1/fs:1-1/fs;
15 - x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) + s*randn(size(t));
16 - SNR = snr(x)
17 - %bandwidth = obw(x,fs);
18 - %C = bandwidth*log2(1+SNR)
19 - %L= 2^(450/(2*bandwidth))
20

```

Command Window

```

>> Untitled3

SNR =

4.3173

```

(c)

```

a=2;
b=0;
c=4;
d=2;
e=6;
f=0;
g=0;
h=1;
A1=(a+b+h);
A2=(b+c+h);
s=(c+d+h)/30;
fs=5000;
F=3;
t= 0:1/fs:1-1/fs;

```

```

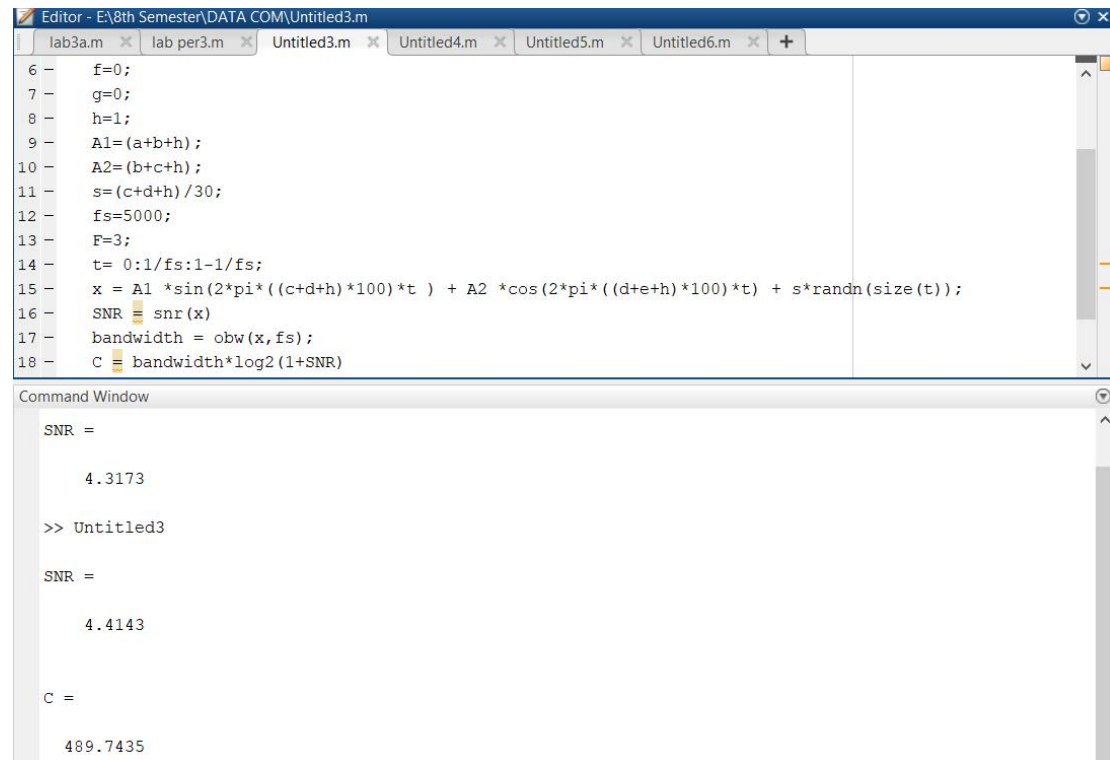
x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) +
s*randn(size(t));
bandwidth = obw(x,fs);

```

```

SNR = snr(x)
C = bandwidth*log2(1+SNR)

```



The image shows a MATLAB Editor window with the following code in 'Untitled3.m':

```

6 - f=0;
7 - g=0;
8 - h=1;
9 - A1=(a+b+h);
10 - A2=(b+c+h);
11 - s=(c+d+h)/30;
12 - fs=5000;
13 - F=3;
14 - t= 0:1/fs:1-1/fs;
15 - x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) + s*randn(size(t));
16 - SNR = snr(x)
17 - bandwidth = obw(x,fs);
18 - C = bandwidth*log2(1+SNR)

```

The Command Window shows the results of the execution:

```

SNR =
    4.3173

>> Untitled3

SNR =
    4.4143

C =
    489.7435

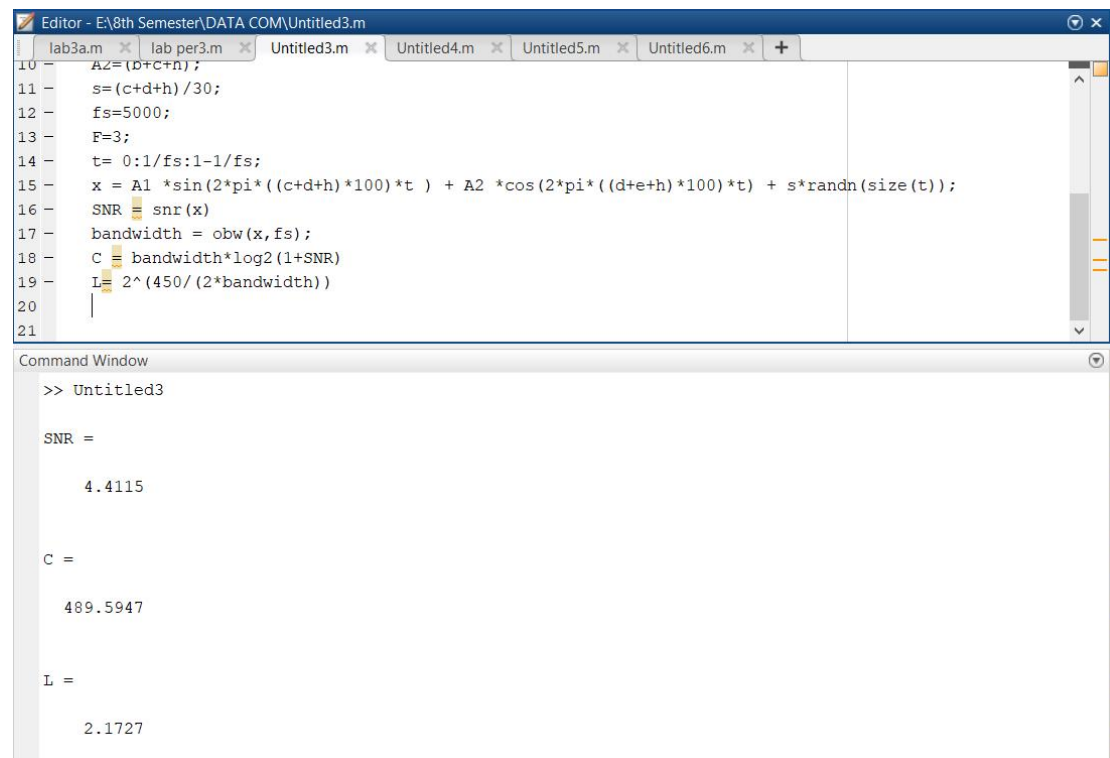
```

(d)

```

a=2;
b=0;
c=4;
d=2;
e=6;
f=0;
g=0;
h=1;
A1=(a+b+h);
A2=(b+c+h);
s=(c+d+h)/30;
fs=5000;
F=3;
t= 0:1/fs:1-1/fs;
x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) +
s*randn(size(t));
SNR = snr(x)
bandwidth = obw(x,fs);
C = bandwidth*log2(1+SNR)
L= 2^(450/(2*bandwidth))

```



The image shows a MATLAB environment with an Editor window and a Command Window. The Editor window contains a script with the following code:

```
10 - A2=(D+C+n);
11 - s=(c+d+h)/30;
12 - fs=5000;
13 - F=3;
14 - t= 0:1/fs:1-1/fs;
15 - x = A1 *sin(2*pi*((c+d+h)*100)*t ) + A2 *cos(2*pi*((d+e+h)*100)*t) + s*randn(size(t));
16 - SNR = snr(x)
17 - bandwidth = obw(x,fs);
18 - C = bandwidth*log2(1+SNR)
19 - L= 2^(450/(2*bandwidth))
20 -
21 -
```

The Command Window shows the results of the script execution:

```
>> Untitled3

SNR =

    4.4115

C =

    489.5947

L =

    2.1727
```