

AMERICAN INTERNATIONAL UNIVERSITY- BANGLADESH
Laboratory Report



Report Title:	Analog Signal quantization using MATLAB		
Lab Report No:	03	Date of Submission:	08-06-2022
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Semester:	Summer 21-22	Program:	BSc. CSE
Course Code:	COE3103	Course Title:	Data Communication
Course Instructor:	Afsah Sharmin	Section:	B

Problem:

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

****Generate aN analog signal using the following equation,**

$$x_1(t) = A_1 \cos(2\pi(\text{CDE} * 100)t)$$

- (a) Select the value of the amplitudes as follows: let $A_1 = \text{GD}$ and $A_2 = \text{AF}$.
- (b) Assuming that a 4-bit ADC channel accepts analog input ranging from 0 to 5 volts, determine
- the number of quantization levels;
 - the step size of the quantizer or resolution;
 - the quantization level when the analog voltage is 3.2 volts;
 - Implement it in MATLAB

Solution:

	MATLAB Code	Output
a	<pre>%AB-CDEFG-H %20-42406-1 %A1=GD;A2=AF A1=62 A2=20 CDE=424</pre>	<pre>A1 = 62 A2 = 20 CDE = 424</pre>
b	<p>I</p> <pre>A1=62; A2=20; CDE=424; fs=40000; t=0:1/fs:1-1/fs; x1=A1*cos(2*pi*(CDE*100)*t); n=4;%4-bit channel Levels=(2^n)-1</pre>	<pre>Levels = 15</pre>
	<p>II</p> <pre>A1=62; A2=20; CDE=424; fs=40000; t=0:1/fs:1-1/fs; x1=A1*cos(2*pi*(CDE*100)*t); n=4;%4-bit channel Levels=(2^n)-1; delta=(max(x1)-min(x1))/Levels</pre>	<pre>delta = 8.2667</pre>
	<p>III</p> <pre>A1=62; A2=20; CDE=424; fs=40000; t=0:1/fs:1-1/fs; x1=A1*cos(2*pi*(CDE*100)*t); n=4;%4-bit channel x=3.2;%3.2V voltage Levels=(2^n)-1; delta=(max(x1)-min(x1))/Levels; i=round((x-min(x1))/delta); Xq=min(x1)+i.*delta</pre>	<pre>Xq = 4.1333</pre>

IV

```
A1=62;
A2=20;
CDE=424;
fs=20000;
t=0:1/fs:0.003;
x1=A1*cos(2*pi*(CDE*100)*t);
n=4; %4-bit channel
Levels=(2^n)-1;
delta=(max(x1)-min(x1))/Levels;
i=round((x1-min(x1))/delta);
Xq=min(x1)+i.*delta;
subplot(3,1,1)
plot(t,x1,'r');
xlabel('Time')
ylabel('X[n]')
subplot(3,1,2)
stem(t,x1,'b');
xlabel('Time')
ylabel('X[n]')
subplot(3,1,3)
stairs(t,Xq,'b');
title('Quantized Signal')
xlabel('Time')
ylabel('Amplitude')
```

