AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Science and Technology

Course Title: Data Communication

Mid Term Lab Assignment

Submitted by:	*Submitted to:*
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Questions:

Assume your **ID** is **AB-CDEFG-H**. Following **variable** values are based on your **ID**:
a1 = G+2
a2 = G+1
f1 = G+4
f2 = G+6

sig_ct = a1*sin(2*pi*f1*t) + a2*cos(2*pi*f2*t)

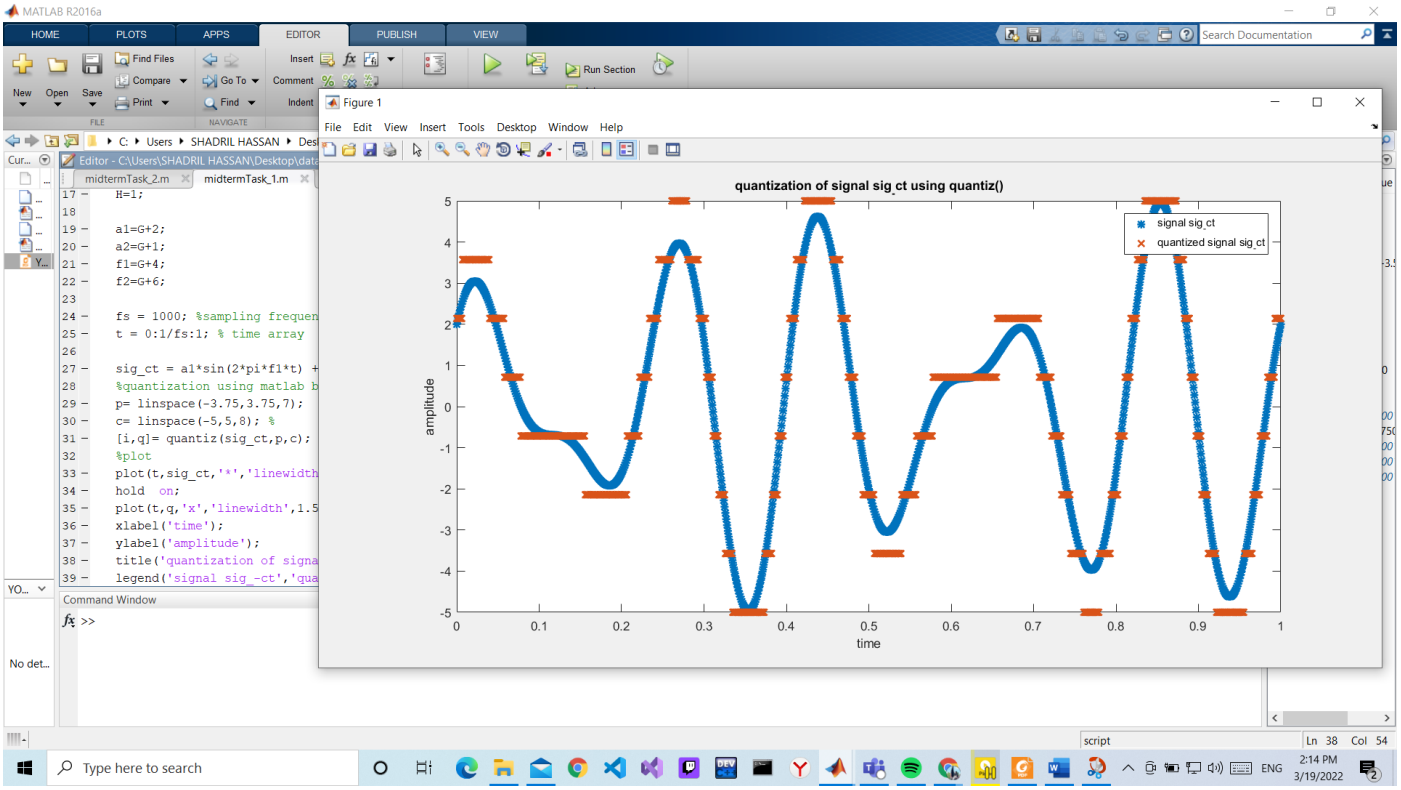
1. Apply **uniform quantization** of **8** levels on **sig_ct** using Matlab built in function **quantiz()**. The quantized levels must be in the midpoint of each of the quantization ranges. Show approximately one full cycle of both **sig_ct** and the **quantized signal** in a single figure window in time domain. In the report, insert the code as text and attach the figure. **Legend, labels**, and **title** are mandatory. Use '*****' marker for **sig_ct** and '**x**' marker for the **quantized signal**. Use such a sampling frequency value so that the points of **sig_ct** and the **quantized signal** are visible clearly and comfortably. (5)

MATLAB Code:

```
clc;
clear all;
close all;
%ID= 20-42451-1
A=2;
B=0;
C=4;
D=2;
E=4;
F=5;
G=1;
H=1;

a1=G+2;
a2=G+1;
f1=G+4;
```

```
f2=G+6;

fs = 1000; %sampling frequency
t = 0:1/fs:1; % time array

%original signal
sig_ct = a1*sin(2*pi*f1*t) + a2*cos(2*pi*f2*t);
%quantization using matlab built-in quantiz()
p= linspace(-3.75,3.75,7);
c= linspace(-5,5,8);
[i,q]= quantiz(sig_ct,p,c);
%plot
plot(t,sig_ct,'*','linewidth',1.5);
hold  on;
plot(t,q,'x','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('quantization of signal sig_-ct');
legend('signal sig_-ct','quantized signal sig_-ct');
```

Output:



2. Apply **uniform quantization** of **4** levels on **sig_ct** **not using** Matlab built in function **quantiz()**. The quantized levels must be in the midpoint of each of the quantization ranges. Show approximately one full cycle of both **sig_ct** and the **quantized signal** in a single figure window in time domain. In the report, insert the code as text and attach the figure. **Legend, labels**, and **title** are mandatory. Use '*****' marker for **sig_ct** and '**x**' marker for the **quantized signal**. Use such a sampling frequency value so that the points of **sig_ct** and the **quantized signal** are visible clearly and comfortably. (**5**)

MATLAB Code:

```
clc;
clear all;
close all;
%ID= 20-42451-1
A=2;
B=0;
C=4;
D=2;
E=4;
F=5;
G=1;
H=1;

a1=G+2;
a2=G+1;
f1=G+4;
f2=G+6;

fs = 1000; %sampling frequency
t = 0:1/fs:1; % time array

sig_ct = a1*sin(2*pi*f1*t) + a2*cos(2*pi*f2*t);%signal

% manual quantization
level=4;
delta= (max(sig_ct)-min(sig_ct))/(level-1);
xq=min(sig_ct)+(round((sig_ct-min(sig_ct))/delta)).*delta;
```

```
% plotting

plot(t,sig_ct,'*','linewidth',1.5);
hold  on;
plot(t,xq,'x','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('quantization of signal sig_-ct');
legend('signal sig_-ct','quantized signal sig_-ct');
```

Output: