American International University- Bangladesh

COE 3103: DATA COMMUNICATION

Mid Lab Assignment

Spring 2021-2022

Section: **Q**
Date: **15/03/2022**

Submitted by,

Student Name	Student Id
Rahman, Sheikh Talha Jubayer	19-41468-3

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)**

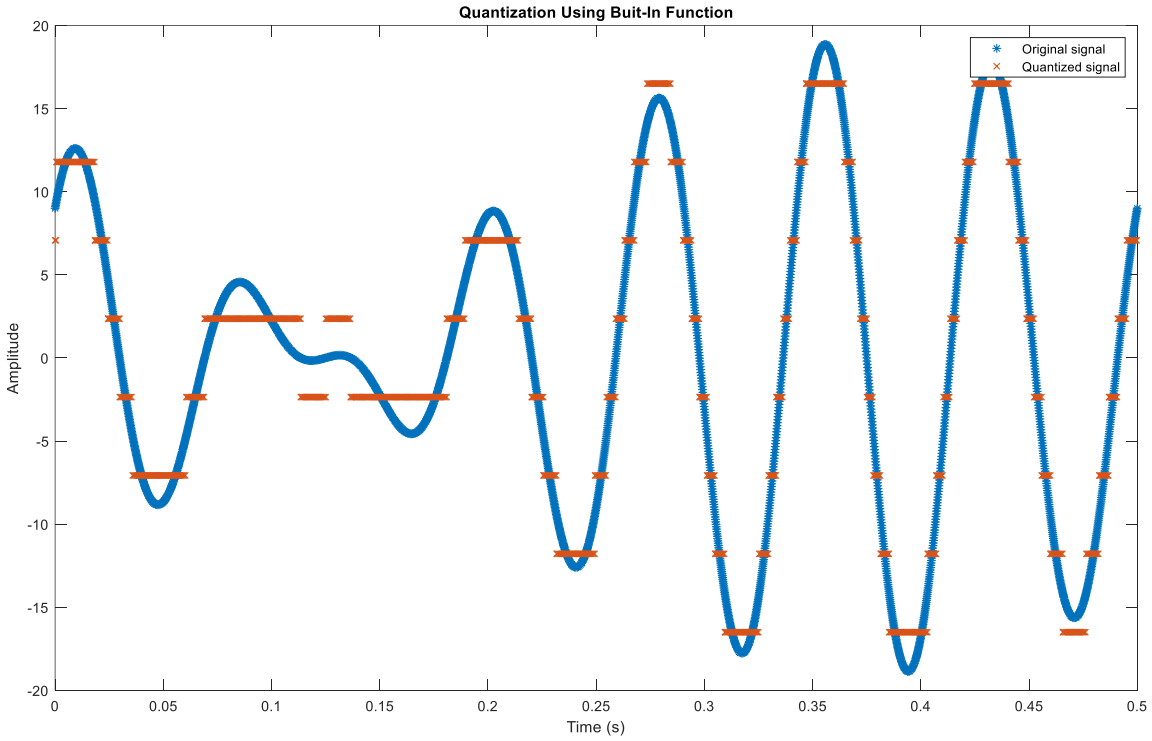
2. Apply **uniform quantization** of **4** levels on **sig_ct** **not using** Matlab built in function **quantiz()**. The quantized levels must be in the midpoint of each of the quantization ranges. Show approximately one full cycle of both **sig_ct** and the **quantized signal** in a single figure window 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)**

Answer of Question 1

```
%ID: 19-41468-3
A = 1;
B = 9;
C = 4;
D = 1;
E = 4;
F = 6;
G = 8;
H = 3;

a1 = G+2; %a1 = 8+2 = 10
a2 = G+1; %a2 = 8+1 = 09
f1 = G+4; %f1 = 8+4 = 12
f2 = G+6; %f2 = 8+6 = 14

fs = 8000;
t = 0:1/fs:1;

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

level = 8;
del = (max(sig_ct)-min(sig_ct))/level;
```

```
p = (min(sig_ct)+del):del:(max(sig_ct)-del);
c = (min(sig_ct)+(del/2)):del:(max(sig_ct)-(del/2));
[i,q] = quantiz(sig_ct,p,c);

plot(t,sig_ct,'*',t,q,'x');
axis([0 0.5 -20 20]);
title('Quantization Using Buit-In Function');
legend('Original signal','Quantized signal');
xlabel('Time (s)');
ylabel('Amplitude');
```

Figure:



Answer of Question 2

```
%ID: 19-41468-3
A = 1;
B = 9;
C = 4;
D = 1;
E = 4;
F = 6;
G = 8;
H = 3;

a1 = G+2; %a1 = 8+2 = 10
a2 = G+1; %a2 = 8+1 = 09
f1 = G+4; %f1 = 8+4 = 12
```

```
f2 = G+6; %f2 = 8+6 = 14

fs = 8000;
t = 0:1/fs:1;

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

level = 4;
Am = (max(sig_ct)-min(sig_ct))/2;
Nsamples = length(sig_ct);
quantised_out = zeros(1,Nsamples);
del = (2*Am)/level;
Llow = -Am+del/2;
Lhigh = Am-del/2;

for i=Llow:del:Lhigh
    for j=1:Nsamples
        if(((i-del/2)<=sig_ct(j))&&(sig_ct(j)<=(i+del/2)))
            quantised_out(j)=i;
        end
    end
end

plot(t,sig_ct,'*',t,quantised_out,'x');
axis([0 0.5 -20 20]);
title('Quantization Using Manual Method');
legend('Original signal','Quantized signal');
xlabel('Time (s)');
ylabel('Amplitude');
```

Figure: