

AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Science and Technology



Course Title: Data Communication

Lab Report-3

Exp. Title: Analog Signal quantization using MATLAB

Submitted by:

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Program: BSc CSE

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Submitted to:

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

$$x(t) = (H+5) \cdot \cos(2\pi((D+E+5) \cdot 10)t) + (H+7) \cdot \sin(2\pi((E+F+10) \cdot 10)t)$$

Q: Apply uniform quantization on signal 'x(t)' using both of the manual quantization methods learnt in this manual. Use ($2^H + 2$) levels for first method and use ($12 - 2^H$) levels for the second one. Attach codes and necessary figures in your report.

Solution (Method- 1):

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;

level= 2^H + 2;
fs=50000;
t=0:1/fs:0.1;

xt= (H+5)*cos(2*pi*((D+E+5)*10)*t) +
(H+7)*sin(2*pi*((E+F+10)*10)*t);

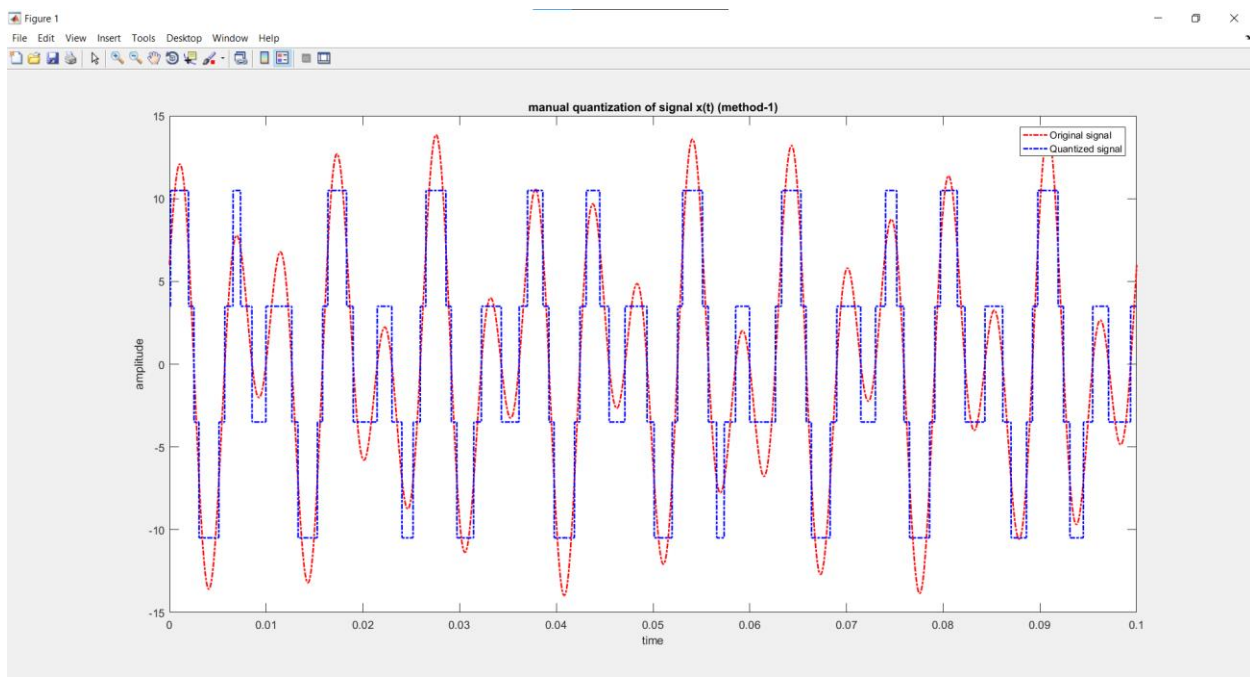
Nsamples=length(xt);%calculating the total number of
samples
quantised_out= zeros(1,Nsamples);
del=(max(xt)-min(xt))/level;%determining the step size
Llow= min(xt)+del/2;
Lhigh= max(xt)-del/2;

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

```
end
end

plot(t,xt,'r-.','linewidth',1.5);
hold on;
plot(t, quantised_out,'b-.','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('manual quantization of signal x(t) (method-1)');
legend('Original signal','Quantized signal');
```

Output:



Solution (Method- 2):

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;

fs= 50000;
t=0:1/fs:0.1;
xt= (H+5)*cos(2*pi*((D+E+5)*10)*t) +
(H+7)*sin(2*pi*((E+F+10)*10)*t);

%quantization
level=12-2^H;
delta= (max(xt)-min(xt))/(level-1);
xq=min(xt)+(round((xt-min(xt))/delta)).*delta;

%plotting
plot(t,xt,'r-.', 'linewidth',1.5);
hold on;
plot(t,xq,'b-.', 'linewidth',1.5);

xlabel('time');
ylabel('amplitude');
title('manual quantization of signal x(t) (method-2)');
legend('original signal','quantized signal');
```

Output:

