AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

DATA COMMUNICATION

Spring 2023-2024

Section: F

Group: 03

Lab: 05

LAB REPORT ON

Analog Signal quantization using MATLAB.

Supervised By

SADMAN SHAHRIAR ALAM

Submitted By

Name	ID
AZMINUR RAHMAN	22-46588-1
TRIDIB SARKAR	22-46444-1
ISTYAK AHMED	21-45658-3
MD. SAKIBUL HAQUE TANMOY	21-45659-3
SAFAR AHMED	19-40752-1

Date of Experiment: **February 28, 2024**

Date of Submission: **February 28, 2024**

Title: Analog Signal quantization using MATLAB.

Performance Task:

ID = AB-CDEFG-H = 22-46588-1

According to the above statement-

A = 2

B = 2

C = 4

D = 6

E = 5

F = 8

G = 8

H = 1

$x = A_1 \cos(2\pi((C+D+E) *100)\ t)$

C + D + E = 4 + 6 + 5 = 15

a) A_1 = G + D = 8 + 6 = 14

A_2 = A + F = 2 + 8 = 10

b)

Given,

n = 4-bit

x_{max} = 5;

x_{min} = 0;

I. The number of quantization levels,

$$L = 2^n = 2^4 = 16$$

II. The step size of the quantizer or resolution,

$$\Delta = \frac{x_{max} - x_{min}}{L}$$

$$= \frac{5-0}{16}$$

$$= 0.3125$$

III. The quantization level when the analog voltage is 3.2 volts,

$$i = round(\frac{x - x_{min}}{\Delta})$$

=10

IV. The binary code produces by the ADC,

1010

V. MATLAB Implementation

```
fs=40e3;% sampling frequency
fc=1500;% frequency of the signal
t=0:1/fs:0.001;%discrete time
x=14*cos(2*pi*fc*t);% discrete signal

%--------Quantization------------%

n=4;
L=(2^n)-1;
delta=(max(x)-min(x))/L;
xq=min(x)+(round((x-min(x))/delta)).*delta;

%--------END------------%

subplot(2,1,1)
stem(t,x,'R');
subplot(2,1,2);% breaking the window figure to plot both graphs
stem(t,x,'b');% plot of discrete time signaltitle('Discrete time representation')%
title of the figure
xlabel('time(s)')% label on the x-axis of the plot
ylabel('X[n]')% label on the y-axis of the plot
subplot(2,1,2);
stairs(t,xq,'b');% the quantized output
title('Quantized Signal')% title of the figure
xlabel('time')% label on the x-axis of the plot
ylabel('amplitude')% label on the y-axis of the plot
```

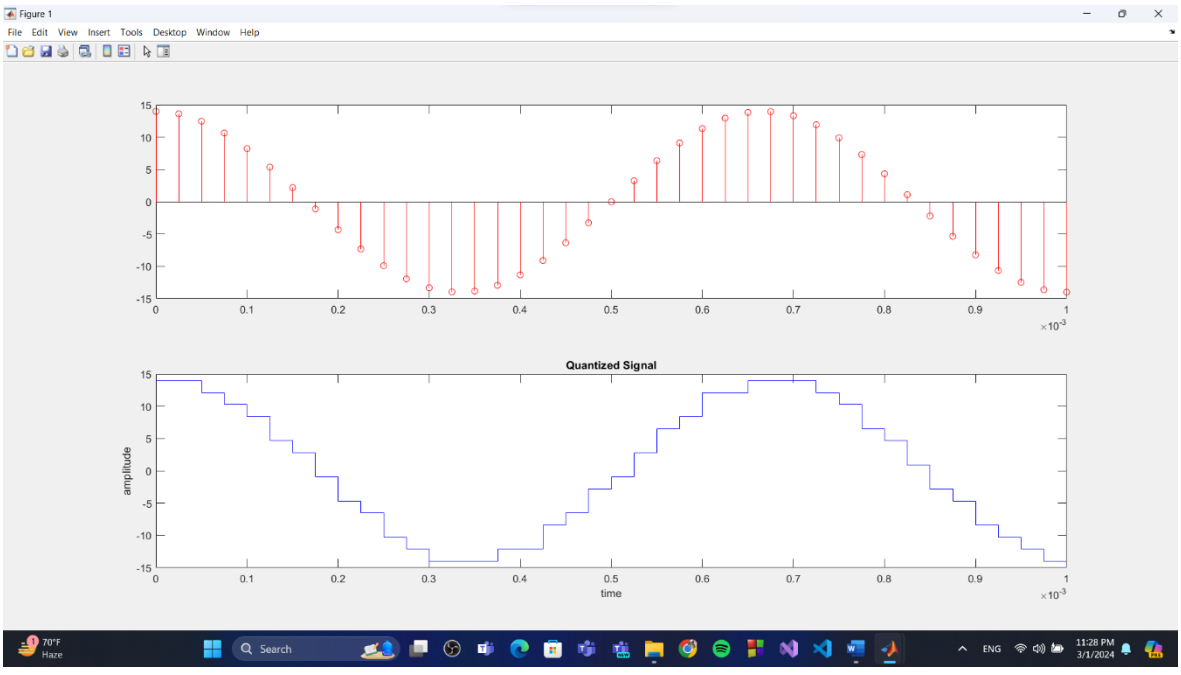

Fig 01: Quantization.