Experiment - 1

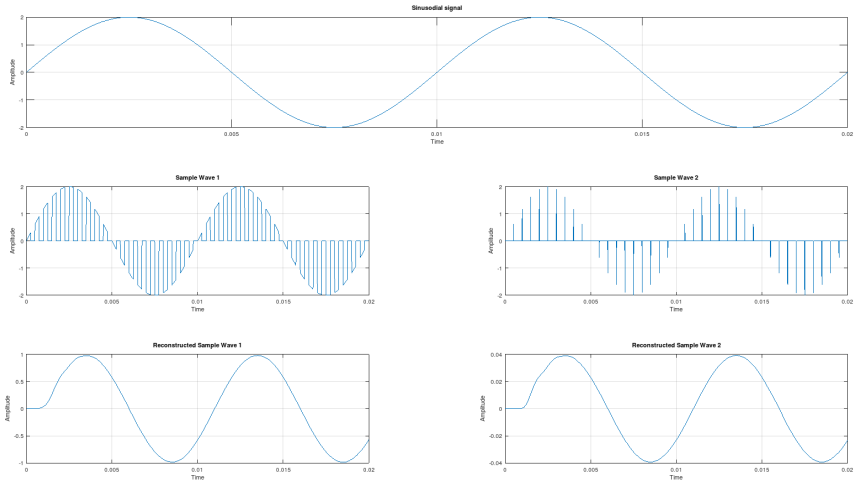
Aim: To Study Sampling Theorem and Simulate the Above using Matlab/Octave.

Code

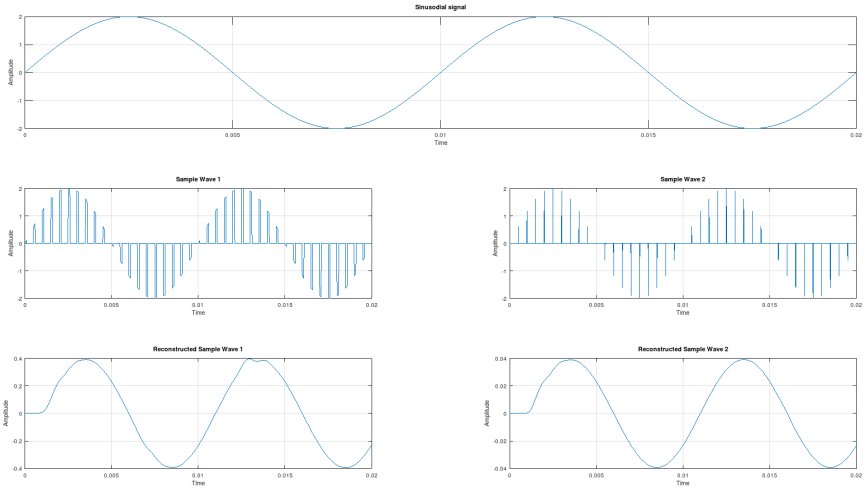
```
% octave pkg to load signal based utils
pkg load signal

clc;
clear alll;
close all;


%Inputs
a = input('Enter the Amplitude: ')
fm = input('Enter the Frequency: ')

fs = 20*fm;
t = 0:1/(1000*fm):2/fm;
s = a*sin(2*pi*fm*t);

% p = (1 + square(2*pi*fs*t, 50))/2;
p = square(2*pi*fs*t, 50);
p(p<0) = 0;

p1 = (1 + square(2*pi*fs*t, 0.1))/2;

sam1 = s.*p;
sam2 = s.*p1;


% Plotting

subplot(3, 1, 1);
plot(t, s);
grid on;
title('Sinusodial signal');
xlabel('Time');
ylabel('Amplitude');

subplot(3, 2, 3);
plot(t, sam1);
grid on;
title('Sample Wave 1');
xlabel('Time');
ylabel('Amplitude');


subplot(3, 2, 4);
plot(t, sam2);
grid on;
title('Sample Wave 2');
xlabel('Time');
ylabel('Amplitude');

% Reconstruction

[n, d] = butter(10, 1/50);
y = filter(n, d, sam1);     %low Pass filtering
y1 = filter(n, d, sam2);

%Plotting

subplot(3, 2, 5);
plot(t, y);
grid on;
title('Reconstructed Sample Wave 1');
xlabel('Time');
ylabel('Amplitude');

subplot(3, 2, 6);
plot(t, y1);
grid on;
title('Reconstructed Sample Wave 2');
xlabel('Time');
ylabel('Amplitude');

%pause in octave
pause
```

Outputs

Case 1: Sampling With 50% duty Cycle (No aliasing)



Case 2: Sampling With 20% duty Cycle (Noise in Recovery)



Case 3: Sampling With 50% duty Cycle (Aliasing)