Question

- Write a script to sample a sinusoidal base band signal of 1000Hz frequency at a sampling frequency of 40KHz. Reduce the sampling frequency by half and then to $1/4^{th}$. Report if the sampling frequency would alter retrieving the baseband signal. Determine around what sampling frequency you start seeing the distortion?

- Given:

Frequency of base band signal =1000Hz

Sampling Frequency =40000Hz

Sampling

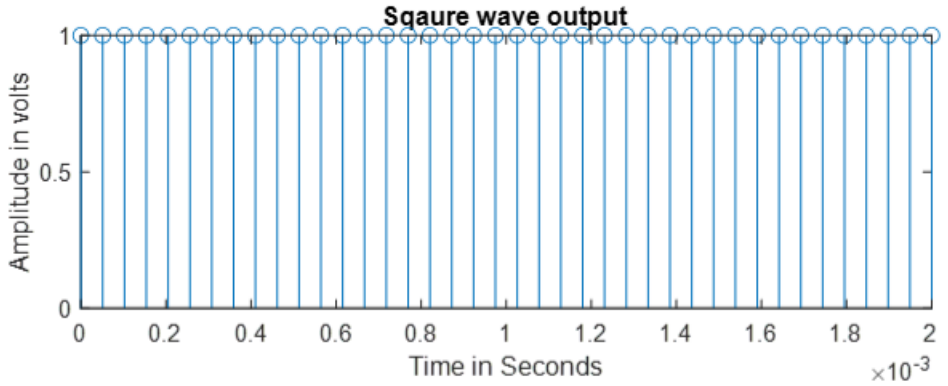
- Reduce continuous time signal to discrete signal

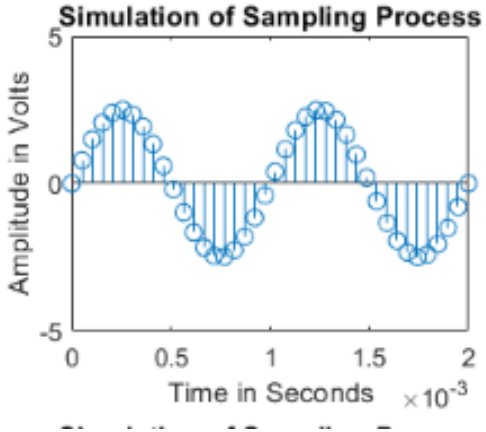
MATLAB Code

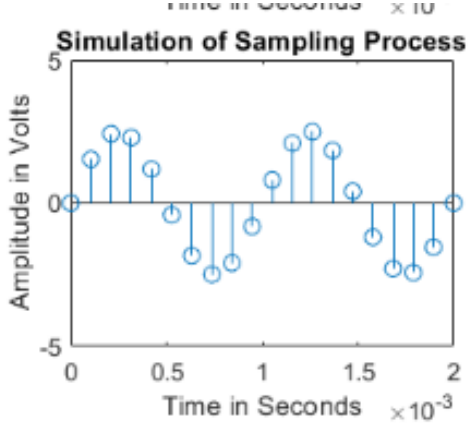
```
clear all;
clc; clf;
fb= 1000; % base band signal
tb= 1/fb;
fs1=40000;
Ns1 = fs1/fb;  %Number of samples in one period of the baseband signal
t1=linspace(0,0.002,Ns1);
sq1=(1+(t1.^2))/2;
asb1=5*sin(2*pi*fb*t1).*sq1;
subplot(221)
plot(t1,sq1);
axis([0 0.002 0 1]);
xlabel('Time in Seconds');
ylabel('Amplitude in Volts')
title('Square Wave Output');
subplot (222)
stem(t1,asb1);
axis([0 0.002 -5 5]);
xlabel('Time in Seconds');
ylabel('Amplitude in Volts')
title('Simulation of Sampling Process')
```

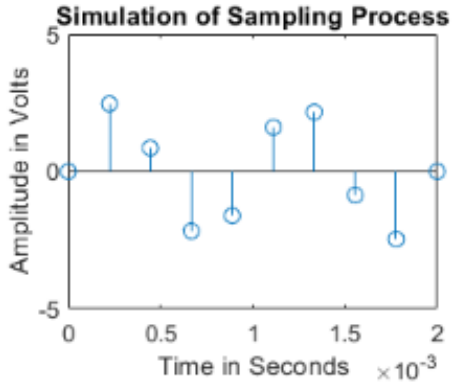
```
fs2=40000/2;
Ns2 = fs2/fb;  %Number of samples in one period of the baseband signal
t2=linspace(0,0.002,Ns2);
sq2=(1+t2.^2)/2;
asb2=5*sin(2*pi*fb*t2).*sq2;
subplot (223)
stem(t2,asb2);
axis([0 0.002 -5 5]);
xlabel('Time in Seconds');
ylabel('Amplitude in Volts')
title('Simulation of Sampling Process')

fs3=40000/4;
Ns3 = fs3/fb;  %Number of samples in one period of the baseband signal
t3=linspace(0,0.002,Ns3);
sq3=(1+t3.^2)/2;
asb3=5*sin(2*pi*fb*t3).*sq3;
subplot (224)
stem(t3,asb3);
axis([0 0.002 -5 5]);
xlabel('Time in Seconds');
ylabel('Amplitude in Volts')
title('Simulation of Sampling Process')
```

Output


Sqaure wave output
Amplitude in volts
Time in Seconds
×10^-3


Simulation of Sampling Process
Amplitude in Volts
Time in Seconds
×10^-3


Simulation of Sampling Process
Amplitude in Volts
Time in Seconds
×10^-3


Simulation of Sampling Process
Amplitude in Volts
Time in Seconds
×10^-3

THANK YOU