**MATLAB CODE**

%Experiment 1: Sampling and Aliasing Date: 22/01/2020

clc;

clear all;

close all;

f = 50;

fs1 = 180;

fs2 = 75;

t = linspace(0,1,fs1\*fs2\*100+1);

t1 = linspace(0,0.1,fs1\*100+1); %Duration of 0.1s

y = sin(2\*pi\*f\*t); %CT Signal

y1 = sin(2\*pi\*f\*t1); %Duration of 0.1s

figure();

subplot(3,3,2);

plot(t1,y1);

xlabel t;

ylabel x(t);

title("CT Signal of Duration 0.1s");

%Sampling the CT signl at 180Hz

y\_sampled1 = [];

i=1;

for k = 1:length(t)

if(mod(t(k),1/fs1) == 0)

y\_sampled1(i) = y(k);

i=i+1;

end

if(t(k)>0.1)

break

end

end

subplot(3,3,4);

stem(0:length(y\_sampled1)-1,y\_sampled1);

xlabel n;

ylabel x1[n];

title("DT version sampled at 180Hz");

y\_sampled2 = [];

i=1;

%Sampling the CT signl at 75Hz

for k = 1:length(t)

if(mod(t(k),1/fs2) == 0)

y\_sampled2(i) = y(k);

i=i+1;

end

if(t(k)>0.1)

break

end

end

subplot(3,3,7);

stem(0:length(y\_sampled2)-1,y\_sampled2);

xlabel n;

ylabel x2[n];

title("DT version sampled at 75Hz");

%Plotting the magnitude spectrum of 180Hz DT Version

Y1\_w = [];

w = linspace(-pi,pi,1000);

k = 1;

for i = 1:length(w)

sum = 0;

for j = 1:length(y\_sampled1)

sum = sum + y\_sampled1(j)\*exp(-1i\*w(i)\*j);

end

Y1\_w(i) = sum;

end

subplot(3,3,5);

plot(w,abs(Y1\_w));

xlabel w;

ylabel X1(w);

title("Magnitude Spectrum vs angular frequency");

subplot(3,3,6);

plot(linspace(-90,90,length(Y1\_w)),abs(Y1\_w));

xlabel f;

ylabel X1(w);

title("Magnitude Spectrum vs frequency");

%Plotting the magnitude spectrum of 75Hz DT Version

Y2\_w = [];

w = linspace(-pi,pi,1000);

k = 1;

for i = 1:length(w)

sum = 0;

for j = 1:length(y\_sampled2)

sum = sum + y\_sampled2(j)\*exp(-1i\*w(i)\*j);

end

Y2\_w(i) = sum;

end

subplot(3,3,8);

plot(w,abs(Y2\_w));

xlabel w;

ylabel X2(w);

title("Magnitude Spectrum vs angular frequency");

subplot(3,3,9);

plot(linspace(-90,90,length(Y2\_w)),abs(Y2\_w));

xlabel f;

ylabel X2(w);

title("Magnitude Spectrum vs frequency");