clc;

clear all;

close all;

A=1;

fm=10;

fs=100;

n= 8

t=0:1/(100\*fm):1;

x=A\*cos(2\*pi\*fm\*t);

%---Sampling-----

ts=0:1/fs:1;

xs=A\*cos(2\*pi\*fm\*ts);

%xs Sampled signal

%--Quantization---

x1=xs+A;

x1=x1/(2\*A);

L=(-1+2^n); % Levels

x1=L\*x1;

xq=round(x1);

r=xq/L;

r=2\*A\*r;

r=r-A;

%r quantized signal

%----Encoding---

y=[];

for i=1:length(xq)

d=dec2bin(xq(i),n);

y=[y double(d)-48];

end

%Calculations

MSE=sum((xs-r).^2)/length(x);

Bitrate=n\*fs;

Stepsize=2\*A/L;

QNoise=((Stepsize)^2)/12;

figure(1)

plot(t,x,'linewidth',2)

title('Sampling')

ylabel('Amplitute')

xlabel('Time t(in sec)')

hold on

stem(ts,xs,'r','linewidth',2)

hold off

legend('Original Signal','Sampled Signal');

figure(2)

stem(ts,x1,'linewidth',2)

title('Quantization')

ylabel('Levels L')

hold on

stem(ts,xq,'r','linewidth',2)

plot(ts,xq,'--r')

plot(t,(x+A)\*L/(2\*A),'--b')

grid

hold off

legend('Sampled Signal','Quantized Signal');

figure(3)

stairs([y y(length(y))],'linewidth',2)

title('Encoding')

ylabel('Binary Signal')

xlabel('bits')

axis([0 length(y) -1 2])

grid