```
close all;
clear;

%% I.1) Dhmiourgia analogikou shmatos kai ektypwsh tou
t=0:.1:20;
F1=.1;
F2=.2;
x=sin(2*pi*F1*t)+sin(2*pi*F2*t);

figure(1);
subplot(4,1,1);
plot(t,x);
title('Original signal');
xlabel('t');
ylabel('x(t)');


%% I.2) Lamvanoume 20 deigmata me 1 deigma/sec
x_samples=x(1:10:201);

subplot(4,1,2);
stem(x_samples,'filled');
title('Sampled signal')
xlabel('n');
ylabel('x_s(n)');
axis([0 20 -2 2]);


%% I.3) Diadikasia anakataskeyhs tou arxikou shmatos
x_recon=0;

for k=0:length(x_samples)-1
    l=k:-.1:-20+k;
    x_recon=x_recon+x_samples(k+1)*sinc(l);
end
   subplot(4,1,3);
   plot(t,x_recon);
   title('Reconstructed signal');
   xlabel('t');
   ylabel('x_r(t)');

%% I.4) Yplogismos kai ektypwsh tou fft
X = fft(x);
k = 0:length(x)-1;
Fs=1;
f = k*Fs/length(X);
subplot(4,1,4);
plot(f,abs(X))
title('Freq domain characterization of the baseband signal')

%% II.2) Scalar quantization
%Theoroume 8 stathmes kvantismou apo -0.8725 ews +1 (me vima 0.25)
partition = [-0.8725:.25:1];
codebook = [-1.0:.25:1];
[index,quants,dist] = quantiz(x,partition,codebook); % Quantize
```

```
%% II.3/4) Xrhsh ths Lloyd gia veltistopoish tou partition/codebook kai
%% sthn synexeia kvantismos
N=8;
[part, codebk]=lloyds(x,N);
[indx,qnts,distortion] = quantiz(x,part,codebk);

%% II.5) Ektypwsh kai me thn LLoyd
figure(2);
subplot(2,1,1);
plot(t,x,'x',t,quants,'.',t,qnts,'o');
xlabel('t');
ylabel('x_q(t)');
title('Quantized Signals')

%% II.7) Ypologismos tou distortion gia diaforetik;es stathmes kvantismou N
for i=2:25
[part2, codebk2]=lloyds(x,i);
[indx,qnts,distortion2(i)] = quantiz(x,part2,codebk2);
end;

%% II.8) Ektypwsh tou distortion gia diaforetiko arithmo sthmwn kvantismou
subplot(2,1,2);
stem(0:24,distortion2);
xlabel('N');
ylabel('Distortion');
title('Distortion for different values of N')
```