**Lab5.m**

% Q1

a=0:(1/8000):2;

f=150\*a;

x=sin(2\*pi\*f.\*a);

subplot(2,1,1), plot(a,f)

subplot(2,1,2), plot(a,x)

audiowrite('sound1.wav',x,8000);

sound(x,8000);

% Q2

a=0:(1/8000):2;

f=150\*a;

x=sin(2\*pi\*f.\*a);

subplot(2,1,1), plot(a,f)

subplot(2,1,2), plot(a,x)

t=0:(1/8000):0.5;

v = [sin(262\*2\*pi\*t), sin(294\*2\*pi\*t)];

audiowrite('sound2.wav',v,8000);

sound(v,8000);

% sound c for 2secs

% ref:< http://www.csun.edu/~hcmth017/notes/node11.html

% % t=linspace(0,2,20000);

% % y=sin(262\*2\*pi\*t);

% % sound(y,10000);

% % yy=sin(294\*2\*pi\*t);

% % sound(yy,10000);

% % audiowrite('soundc.wav',y,8000);

% % freq = [262 294 330 349 392 440 494 523];

% %

% % for kk = 1:length(freq)

% % curfreq = freq(kk);

% % disp(curfreq)

% % t=linspace(0,2,20000);

% % y=sin(curfreq\*2\*pi\*t);

% % sound(y,10000);

% % pause(0.5);

% % end

fs = 16000; % for 4000, 8000, 16000 sound same because sound is not distortaed

freq = [262 294 330 349 392 440 494 523];

for kk = 1:length(freq)

curfreq = freq(kk);

disp(curfreq)

t=0:(1/fs):0.5;

y=sin(curfreq\*2\*pi\*t);

sound(y,fs);

pause(0.5);

end

% q2 1

t=0:(1/8000):0.5;

myVector = [sin(262\*2\*pi\*t) sin(294\*2\*pi\*t) sin(330\*2\*pi\*t) sin(349\*2\*pi\*t) sin(392\*2\*pi\*t) sin(440\*2\*pi\*t) sin(494\*2\*pi\*t) sin(523\*2\*pi\*t)];

audiowrite('Cscale.wav',myVector,8000);

sound(myVector,8000);

%q2 2 hears fone as expected

% q2 3

[y,fs]=audioread('Cscale.wav');

sound(y,fs);

sound(y,4000);% sound low pitch and slower rate than fs=8000 bcs it collects less samples per sec

sound(y,16000); % sound high pitch and faster rate than fs=8000 bcs it collects more samples per sec

% other way to do it

t=0:(1/4000):0.5;

myVector = [sin(262\*2\*pi\*t) sin(294\*2\*pi\*t) sin(330\*2\*pi\*t) sin(349\*2\*pi\*t) sin(392\*2\*pi\*t) sin(440\*2\*pi\*t) sin(494\*2\*pi\*t) sin(523\*2\*pi\*t)];

% audiowrite('Cscale.wav',myVector,8000);

sound(myVector,4000); % sound low pitch and slower rate than fs=8000 bcs it collects less samples per sec

t=0:(1/16000):0.5;

myVector = [sin(262\*2\*pi\*t) sin(294\*2\*pi\*t) sin(330\*2\*pi\*t) sin(349\*2\*pi\*t) sin(392\*2\*pi\*t) sin(440\*2\*pi\*t) sin(494\*2\*pi\*t) sin(523\*2\*pi\*t)];

% audiowrite('Cscale.wav',myVector,8000);

sound(myVector,16000); % sound high pitch and faster rate than fs=8000 bcs it collects more samples per sec

% if change both t interval 1/fs and sound to play given fs ..sound will remain the same.

% ref https://sites.google.com/site/ecte906ofzkk/lab-exercises/lab-05

% % keys = [40 42 44 45 47 49 51 52];

% % freq = [262 294 330 349 392 440 494 523];

% % dur = 0.25\*ones(1,length(keys));

% % fs = 11025;

% % xx = zeros(1,sum(dur)\*fs+1);

% % n1 = 1;

% % for kk = 1:length(keys)

% % keynum = keys(kk);

% % dur1 = dur(kk);

% % tone = key2note(xx,keynum,dur1);

% % n2 = n1+length(tone)-1;

% % xx(n1:n2) = xx(n1:n2)+tone;

% % n1=n2;

% % end

% %

% % audiowrite('sound2.wav',xx,8000);

% % soundsc(xx,fs);

% q2 4)

[y,fs]=audioread('Cscale.wav');

z = zeros(1,length(y));

z = flipud(y)

audiowrite('CscaleZ.wav',z,fs);

% reverse scale C B A G F E D C from high to low frequncy sound

% for k = 1: length(y)

% Z(k)=y(-k)

% end

% Q3

% ref : https://www.mathworks.com/help/matlab/ref/audiowrite.html

% q3 1

t=0:(1/8000):2;

f=262;

xk=sin(2\*pi\*f.\*t);

audiowrite('Cmajor1.wav',xk,8000);

sound(xk,8000);

fftxk = fft(xk);

tt =0:0.01:5;

% plot the magnitude response

stem(t,abs(fftxk))

xlabel('k');

ylabel('FFT of x(k)');

title('Magnitude Spectrum');

yline(262,'--k','Frequency of C major ~ 262')

% q3 2

[y,fs]=audioread('Cmajor1.wav');

audioinfo('Cmajor1.wav')

% Y is single or double because they are normalized and in the range of -1 and 1

% proof by

plot(y)

ylabel('range of y -1 to 1');

% q3 3

t=0:(1/8000):2;

f=262;

xk=20\*sin(2\*pi\*f.\*t);

subplot(2,1,1), plot(t,f)

subplot(2,1,2), plot(t,xk)

audiowrite('Cmajor2.wav',xk,8000);

% % yes warning

% Warning: Data clipped when writing file.

% > In audiowrite>clipInputData (line 470)

% In audiowrite (line 241)

% q3 4

[cy1,fs1]=audioread('Cmajor1.wav');

[cy2,fs2]=audioread('Cmajor2.wav');

sound(cy1,fs1);

sound(cy2,fs2);

t=0:(1/8000):2;

subplot(2,1,1), plot(t,20\*sin(2\*pi\*f.\*t))

xlabel('t');

ylabel('cy2');

title('CY2 with peak magnitude of 20');

subplot(2,1,2), plot(t,sin(2\*pi\*f.\*t))

xlabel('t');

ylabel('cy1');

title('CY1 with peak magnitude of 1');

%-----------

t=0:(1/8000):2;

subplot(2,1,1), plot(cy1)

xlabel('t');

ylabel('cy1');

title('CY1 with peak magnitude of 1');

subplot(2,1,2), plot(cy2)

xlabel('t');

ylabel('cy2');

title('CY2 with peak magnitude of 20');

%-----------

% different sounds

% in cy2 all the values greater than 1 and less than -1 is cut and that

% explained the warning given when saving into a wav file

% q3 5

subplot(2,1,1),plot(abs(fft(cy1)))

xlabel('k');

ylabel('FFT of CY1');

title('Magnitude Response of CY1');

subplot(2,1,2),plot(abs(fft(cy2)))

xlabel('k');

ylabel('FFT of CY2');

title('Magnitude Response of CY2');

% % cy2 has multiple small spikes between

% q3 6

[y,fs]=audioread('sound1.wav');

audiowrite('sound2.wav',20\*y,fs);

% % yes warning

% Warning: Data clipped when writing file.

% > In audiowrite>clipInputData (line 470)

% In audiowrite (line 241)

[y2,fs2]=audioread('sound2.wav');

sound(y,fs);

sound(y2,fs2);

% dont sound the same sound2 seems to have a wavy effect at the end, where sound1 is smooth

subplot(2,1,1),plot(y)

xlabel('k');

ylabel('y');

title('Magnitude Response of sound1');

subplot(2,1,2),plot(y2)

xlabel('k');

ylabel('y2');

title('Magnitude Response of sound2');