% Linear System EE210 Mini Project 2 %

clc;

clear;

% Reading Music File %

[x,fs] = audioread('jk.wav');

%ploting signal in time domain %

N = length(x);

n = 0:N-1;

t = n/fs;

stem(n, x)

xlabel('n---->');

ylabel('x[n]');

title('plot of song in time domain ( n vs x[n] )');

figure;

plot(t, x)

xlabel('t---->');

ylabel('x(t)');

title('plot of song in time domain ( t vs x(t) )');

%time domain plot ends%

%ploting plot in frequency domain %

OM = 0:0.001:pi;

X = exp(-j\*OM'\*n)\*x;

fq = OM\*fs/(2\*pi);

figure;

plot(fq,abs(X))

grid on;

xlabel('fq---->');

ylabel('Magnitude of X');

title('Magnitude response of signal (f vs X)');

figure;

plot(fq, angle(X))

xlabel('fq---->');

ylabel('Angle of X');

title('Phase response of signal (f vs X)');

figure;

plot(OM, abs(X))

grid on;

xlim([0 pi]);

xlabel('OM---->');

ylabel('Magnitude of X');

title('Magnitude response of signal ( OM vs X)');

figure;

plot(OM, angle(X))

xlim([0 pi]);

xlabel('OM---->');

ylabel('Angle of X');

title('Phase response of signal ( OM vs X)');

% frequency plot ends %

% define filter %

z = exp(j\*OM);

nm = 0.999999;

dm = 0.99;

f1 = 800.1/22050;

f2 = 1804/22050;

N11 = (z - nm\*exp(-j\*f1\*pi));

N21 = (z - nm\*exp(j\*f1\*pi));

D11 = (z - dm\*exp(-j\*f1\*pi));

D21 = (z - dm\*exp(j\*f1\*pi));

N1 = N11.\*N21;

D1 = D11.\*D21;

H1 = N1./D1;

N21 = (z - nm\*exp(-j\*f2\*pi));

N22 = (z - nm\*exp(j\*f2\*pi));

D21 = (z - dm\*exp(-j\*f2\*pi));

D22 = (z - dm\*exp(j\*f2\*pi));

N2 = N21.\*N22;

D2 = D21.\*D22;

H2 = N2./D2;

H = H1.\*H2;

figure;

plot(OM, abs(H))

xlim([0 pi]);

xlabel('OM---->');

ylabel('Normal scale mangnitude of filter H(z)');

title('Normal scale filter response of H ( OM vs H)');

figure;

plot(OM, 20\*log(abs(H)))

xlim([0 pi]);

xlabel('OM---->');

ylabel('dB scale mangnitude (dB) of filter H(z)');

title('dB scale filter response of H ( OM vs H)');

% filter ends %

% zplane starts %

Z1 = [nm\*exp(j\*f1\*pi); nm\*exp(-j\*f1\*pi); nm\*exp(j\*f2\*pi); nm\*exp(-j\*f2\*pi)]

P1 = [dm\*exp(j\*f1\*pi) dm\*exp(-j\*f1\*pi) dm\*exp(j\*f2\*pi) dm\*exp(-j\*f2\*pi)]

k = 1;

[num, den] = zp2tf(Z1, P1, k)

figure;

zplane(num, den)

tf(num, den)

% zplane ends %

% filtering process starts %

y = filter(num, den, x);

sound(x, fs)

pause(5);

sound(y, fs)

% filtering process ends %

% frequency plot of output %

R = length(y);

l = 0:R-1;

Y = exp(-j\*OM'\*l)\*y;

fq = OM\*fs/(2\*pi);

figure;

plot(fq,abs(Y))

grid on;

xlabel('fq---->');

ylabel('Magnitude of Y');

title('Magnitude response of signal (f vs Y)');

figure;

plot(fq, angle(Y))

xlabel('fq---->');

ylabel('Angle of Y');

title('Phase response of signal (f vs Y)');

figure;

plot(OM, abs(Y))

grid on;

xlim([0 pi]);

xlabel('OM---->');

ylabel('Magnitude of Y');

title('Magnitude response of signal ( OM vs Y)');

figure;

plot(OM, angle(Y))

xlim([0 pi]);

xlabel('OM---->');

ylabel('Angle of Y');

title('Phase response of signal ( OM vs Y)');

% frequency plot of output ends %