%Q1

%% (a) Create the discrete-time sequence x[n] = u[n] - u[n - 10]

n = 0:20; % we chose 20 since the signal will have change in value at n =10

u\_n = zeros(size(n)); % unit-step function u[n]

u\_n(n >= 0) = 1;

u\_n\_10 = zeros(size(n)); %unit-step function u[n - 10]

u\_n\_10(n >= 10) = 1; % as the unit-step function, it will become value 1 when n =10

x = u\_n - u\_n\_10; %unit-step function u[n - 10]

figure;

stem(n, x);

title('x[n] = u[n] - u[n - 10]');

xlabel('n');

ylabel('x[n]');

%% (b) Convolution operations

an = conv(x, x, 'full'); % In order to better obvious the signal, we chose Returns the full convolution,

bn = conv(an, x, 'full'); % The output signal is the full-length convolution of the two signals

cn = conv(bn, x, 'full');

dn = conv(cn, x, 'full');

%% (c) Plot a[n], b[n], c[n], d[n]

n\_a = 0:length(an) - 1;

n\_b = 0:length(bn) - 1;

n\_c = 0:length(cn) - 1;

n\_d = 0:length(dn) - 1;

figure;

subplot(2, 2, 1);

stem(n\_a, an);

title('a[n] = x[n] \* x[n]');

xlabel('n');

ylabel('a[n]');

subplot(2, 2, 2);

stem(n\_b, bn);

title('b[n] = a[n] \* x[n]');

xlabel('n');

ylabel('b[n]');

subplot(2, 2, 3);

stem(n\_c, cn);

title('c[n] = b[n] \* x[n]');

xlabel('n');

ylabel('c[n]');

subplot(2, 2, 4);

stem(n\_d, dn);

title('d[n] = c[n] \* x[n]');

xlabel('n');

ylabel('d[n]');

%Q2

%% Load the supplied acoustic impulse response of a room

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

soundsc(impr, fs); %the sound of clap?

%Plot the impulse-response waveform impr using the plot() command and listen to it

%using the soundsc() command.

figure;

plot(impr);

title('Impulse Response');

xlabel('Sample');

ylabel('Amplitude');

%% Load the orignal speech

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

soundsc(y, fs); %listen to the original speach.

figure; %plot the original speech.

plot(y);

title('original speech');

xlabel('Sample');

ylabel('Amplitude');

%% Convolve the speech signal with the impulse response,

convolved\_signal = conv(y, impr);

soundsc(convolved\_signal, fs); % dont ask me to carry all the rag like that?

figure;

plot(convolved\_signal);

title('Convolved Signal');

xlabel('Sample');

ylabel('Amplitude');