

DSP FINAL PROJET: MATLAB AUDIO EQUALISER

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.M CODE (UNTIL PAGE 21):

```
function varargout = AudioEqualizer(varargin)
% AUDIOEQUALIZER MATLAB code for AudioEqualizer.fig
%     AUDIOEQUALIZER, by itself, creates a new AUDIOEQUALIZER or raises the
existing
%     singleton*.
%
%     H = AUDIOEQUALIZER returns the handle to a new AUDIOEQUALIZER or the
handle to
%     the existing singleton*.
%
%     AUDIOEQUALIZER('CALLBACK',hObject,eventData,handles,...) calls the
local
%     function named CALLBACK in AUDIOEQUALIZER.M with the given input
arguments.
%
%     AUDIOEQUALIZER('Property','Value',...) creates a new AUDIOEQUALIZER or
raises the
%     existing singleton*. Starting from the left, property value pairs are
%     applied to the GUI before AudioEqualizer_OpeningFcn gets called. An
%     unrecognized property name or invalid value makes property application
%     stop. All inputs are passed to AudioEqualizer_OpeningFcn via
varargin.
%
%     *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
%     instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help AudioEqualizer

% Last Modified by GUIDE v2.5 29-May-2022 19:02:26

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                  'gui_Singleton',   gui_Singleton, ...
                  'gui_OpeningFcn', @AudioEqualizer_OpeningFcn, ...
                  'gui_OutputFcn',  @AudioEqualizer_OutputFcn, ...
                  'gui_LayoutFcn',   [] , ...
                  'gui_Callback',    []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end
```

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if nargin
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT

% --- Executes just before AudioEqualizer is made visible.
function AudioEqualizer_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles     structure with handles and user data (see GUIDATA)
% varargin    command line arguments to AudioEqualizer (see VARARGIN)

% Choose default command line output for AudioEqualizer
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes AudioEqualizer wait for user response (see UIRESUME)
% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = AudioEqualizer_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles     structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in browse.
function browse_Callback(hObject, eventdata, handles)
% hObject    handle to browse (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles     structure with handles and user data (see GUIDATA)
global Fs;
global num1;
global num2;
global num3;
global num4;
global num5;
global num6;
global num7;
global num8;
global num9;
global den1;
global den2;
global den3;

```

```

global den4;
global den5;
global den6;
global den7;
global den8;
global den9;
global g1;
global g2;
global g3;
global g4;
global g5;
global g6;
global g7;
global g8;
global g9;
global y1;
global y2;
global y3;
global y4;
global y5;
global y6;
global y7;
global y8;
global y9;
global type;
global filename;
global Y;
global X;
[filename pathname] = uigetfile({'*.wav'}, 'File Selector');
handles.fullpathname = strcat(pathname, filename);
set(handles.edit1, 'String', handles.fullpathname)
[X, Fs]=audioread(filename);
type = get(handles.filtertype, 'value');
switch(type)
    case 1
        %fir filters
        [num1,den1] = fir1(100,170/Fs, 'low');
        [num1,den1] = eqtflength(num1,den1);
        [num2,den2] = fir1(100,[170/Fs 310/Fs], 'bandpass');
        [num2,den2] = eqtflength(num2,den2);
        [num3,den3] = fir1(100,[310/Fs 600/Fs], 'bandpass');
        [num3,den3] = eqtflength(num3,den3);
        [num4,den4] = fir1(100,[600/Fs 1000/Fs], 'bandpass');
        [num4,den4] = eqtflength(num4,den4);
        [num5,den5] = fir1(100,[1000/Fs 3000/Fs], 'bandpass');
        [num5,den5] = eqtflength(num5,den5);
        [num6,den6] = fir1(100,[3000/Fs 6000/Fs], 'bandpass');
        [num6,den6] = eqtflength(num6,den6);
        [num7,den7] = fir1(100,[6000/Fs 12000/Fs], 'bandpass');
        [num7,den7] = eqtflength(num7,den7);
        [num8,den8] = fir1(100,[12000/Fs 14000/Fs], 'bandpass');
        [num8,den8] = eqtflength(num8,den8);
        [num9,den9] = fir1(100,[14000/Fs 16000/Fs], 'bandpass');
        [num9,den9] = eqtflength(num9,den9);
    case 2
        %iir filters
        Fs=2*Fs;

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Fm=Fs/2;
[num1,den1]=butter(4,170/Fm,'low');
[num2,den2]=butter(4,[170/Fm 310/Fm],'bandpass');
[num3,den3]=butter(4,[310/Fm 600/Fm],'bandpass');
[num4,den4]=butter(4,[600/Fm 1000/Fm],'bandpass');
[num5,den5]=butter(4,[1000/Fm 3000/Fm],'bandpass');
[num6,den6]=butter(4,[3000/Fm 6000/Fm],'bandpass');
[num7,den7]=butter(4,[6000/Fm 12000/Fm],'bandpass');
[num8,den8]=butter(4,[12000/Fm 14000/Fm],'bandpass');
[num9,den9]=butter(4,[14000/Fm 16000/Fm],'bandpass');
fprintf('\nInput sampling rate doubled to use IIR filters\n');

end
y1=filter(num1,den1,X);
y2=filter(num2,den2,X);
y3=filter(num3,den3,X);
y4=filter(num4,den4,X);
y5=filter(num5,den5,X);
y6=filter(num6,den6,X);
y7=filter(num7,den7,X);
y8=filter(num8,den8,X);
y9=filter(num9,den9,X);
fprintf('Input Sampling Rate = %d',Fs);

function edit1_Callback(hObject, eventdata, handles)
% hObject      handle to edit1 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit1 as text
%         str2double(get(hObject,'String')) returns contents of edit1 as a
double

% --- Executes during object creation, after setting all properties.
function edit1_CreateFcn(hObject, eventdata, handles)
% hObject      handle to edit1 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on selection change in filtertype.
function filtertype_Callback(hObject, eventdata, handles)
% hObject      handle to filtertype (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns filtertype
contents as cell array

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%         contents{get(hObject,'Value')} returns selected item from filtertype

% --- Executes during object creation, after setting all properties.
function outputfs_CreateFcn(hObject, eventdata, handles)
% hObject    handle to outputfs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on slider movement.
function slider1_Callback(hObject, eventdata, handles)
% hObject    handle to slider1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%         get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g1;
g1 = get(hObject,'Value');
set(handles.edit3,'String',num2str(g1));

% --- Executes during object creation, after setting all properties.
function slider1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider2_Callback(hObject, eventdata, handles)
% hObject    handle to slider2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%         get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g2;

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g2 = get(hObject,'Value');
set(handles.edit4,'String',num2str(g2));

% --- Executes during object creation, after setting all properties.
function slider2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider3_Callback(hObject, eventdata, handles)
% hObject    handle to slider3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%         get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g3;
g3 = get(hObject,'Value');
set(handles.edit5,'String',num2str(g3));

% --- Executes during object creation, after setting all properties.
function slider3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider4_Callback(hObject, eventdata, handles)
% hObject    handle to slider4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%         get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g4;

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g4 = get(hObject,'Value');
set(handles.edit6,'String',num2str(g4));

% --- Executes during object creation, after setting all properties.
function slider4_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider5_Callback(hObject, eventdata, handles)
% hObject    handle to slider5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g5;
g5 = get(hObject,'Value');
set(handles.edit7,'String',num2str(g5));

% --- Executes during object creation, after setting all properties.
function slider5_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called
% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider6_Callback(hObject, eventdata, handles)
% hObject    handle to slider6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g6;
g6 = get(hObject,'Value');
set(handles.edit8,'String',num2str(g6));

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% --- Executes during object creation, after setting all properties.
function slider6_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider7_Callback(hObject, eventdata, handles)
% hObject    handle to slider7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g7;
g7 = get(hObject,'Value');
set(handles.edit9,'String',num2str(g7));

% --- Executes during object creation, after setting all properties.
function slider7_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider8_Callback(hObject, eventdata, handles)
% hObject    handle to slider8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g8;
g8 = get(hObject,'Value');
set(handles.edit10,'String',num2str(g8));

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% --- Executes during object creation, after setting all properties.
function slider8_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

% --- Executes on slider movement.
function slider9_Callback(hObject, eventdata, handles)
% hObject    handle to slider9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider
global g9;
g9 = get(hObject,'Value');
set(handles.edit11,'String',num2str(g9));

% --- Executes during object creation, after setting all properties.
function slider9_CreateFcn(hObject, eventdata, handles)
% hObject    handle to slider9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: slider controls usually have a light gray background.
if isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor',[.9 .9 .9]);
end

function edit3_Callback(hObject, eventdata, handles)
% hObject    handle to edit3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit3 as text
%        str2double(get(hObject,'String')) returns contents of edit3 as a
double
global g1;
g1=str2num(get(hObject,'String'));
minn=get(handles.slider1,'Min');
maxx=get(handles.slider1,'Max');

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if(g1<minn || g1>maxx)
    g1=get(handles.slider1,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider1,'Value',g1);
end

% --- Executes during object creation, after setting all properties.
function edit3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit4_Callback(hObject, eventdata, handles)
% hObject    handle to edit4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit4 as text
%         str2double(get(hObject,'String')) returns contents of edit4 as a
double
global g2;
g2=str2num(get(hObject,'String'));
minn=get(handles.slider2,'Min');
maxx=get(handles.slider2,'Max');
if(g2<minn || g2>maxx)
    g2=get(handles.slider2,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider2,'Value',g2);
end

% --- Executes during object creation, after setting all properties.
function edit4_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

```

```

function edit5_Callback(hObject, eventdata, handles)
% hObject      handle to edit5 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit5 as text
%         str2double(get(hObject,'String')) returns contents of edit5 as a
double
global g3;
g3=str2num(get(hObject,'String'));
minn=get(handles.slider3,'Min');
maxx=get(handles.slider3,'Max');
if(g3<minn || g3>maxx)
    g3=get(handles.slider3,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider3,'Value',g3);
end

% --- Executes during object creation, after setting all properties.
function edit5_CreateFcn(hObject, eventdata, handles)
% hObject      handle to edit5 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit6_Callback(hObject, eventdata, handles)
% hObject      handle to edit6 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit6 as text
%         str2double(get(hObject,'String')) returns contents of edit6 as a
double
global g4;
g4=str2num(get(hObject,'String'));
minn=get(handles.slider4,'Min');
maxx=get(handles.slider4,'Max');
if(g4<minn || g4>maxx)
    g4=get(handles.slider4,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider4,'Value',g4);
end

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```

% --- Executes during object creation, after setting all properties.
function edit6_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit7_Callback(hObject, eventdata, handles)
% hObject    handle to edit7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit7 as text
%         str2double(get(hObject,'String')) returns contents of edit7 as a
double
global g5;
g5=str2num(get(hObject,'String'));
minn=get(handles.slider5,'Min');
maxx=get(handles.slider5,'Max');
if(g5<minn || g5>maxx)
    g5=get(handles.slider5,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider5,'Value',g5);
end

% --- Executes during object creation, after setting all properties.
function edit7_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit8_Callback(hObject, eventdata, handles)
% hObject    handle to edit8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit8 as text

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%         str2double(get(hObject,'String')) returns contents of edit8 as a
double
global g6;
g6=str2num(get(hObject,'String'));
minn=get(handles.slider6,'Min');
maxx=get(handles.slider6,'Max');
if(g6<minn || g6>maxx)
    g6=get(handles.slider6,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider6,'Value',g6);
end

% --- Executes during object creation, after setting all properties.
function edit8_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit9_Callback(hObject, eventdata, handles)
% hObject    handle to edit9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit9 as text
%         str2double(get(hObject,'String')) returns contents of edit9 as a
double
global g7;
g7=str2num(get(hObject,'String'));
minn=get(handles.slider7,'Min');
maxx=get(handles.slider7,'Max');
if(g7<minn || g7>maxx)
    g7=get(handles.slider7,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider7,'Value',g7);
end

% --- Executes during object creation, after setting all properties.
function edit9_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.

```

```

%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit10_Callback(hObject, eventdata, handles)
% hObject      handle to edit10 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit10 as text
%          str2double(get(hObject,'String')) returns contents of edit10 as a
double
global g8;
g8=str2num(get(hObject,'String'));
minn=get(handles.slider8,'Min');
maxx=get(handles.slider8,'Max');
if(g8<minn || g8>maxx)
    g8=get(handles.slider8,'Value');
    set(hObject,'String',num2str(0));
else
    set(handles.slider8,'Value',g8);
end

% --- Executes during object creation, after setting all properties.
function edit10_CreateFcn(hObject, eventdata, handles)
% hObject      handle to edit10 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function edit11_Callback(hObject, eventdata, handles)
% hObject      handle to edit11 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit11 as text
%          str2double(get(hObject,'String')) returns contents of edit11 as a
double
global g9;
g9=str2num(get(hObject,'String'));
minn=get(handles.slider9,'Min');
maxx=get(handles.slider9,'Max');
if(g9<minn || g9>maxx)

```

```

        g9=get(handles.slider9,'Value');
        set(hObject,'String',num2str(0));
else
    set(handles.slider9,'Value',g9);
end

% --- Executes during object creation, after setting all properties.
function edit11_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit11 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in play.
function play_Callback(hObject, eventdata, handles)
% hObject    handle to play (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
global filename;
global player;
global Y;
global X;
global Fs;
global Fs0;
global g1;
global g2;
global g3;
global g4;
global g5;
global g6;
global g7;
global g8;
global g9;
global y1;
global y2;
global y3;
global y4;
global y5;
global y6;
global y7;
global y8;
global y9;
[X,Fs]=audioread(filename);
Y=g1*y1+g2*y2+g3*y3+g4*y4+g5*y5+g6*y6+g7*y7+g8*y8+g9*y9;
if (strcmp(get(handles.edit12,'String'),'Default'));
    Fs0 = Fs;
    fprintf('\nOutput Sample Rate = %d\n',Fs);
else

```

```

        FsO= str2num(get(handles.edit12,'String'));
        fprintf('\nOutput Sample Rate = %d\n',FsO);
end
player = audioplayer(Y,FsO);
play(player)
audiowrite('Project_Output.wav',Y,FsO);

% --- Executes on button press in pause.
function pause_Callback(hObject, eventdata, handles)
% hObject      handle to pause (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global player;
pause(player)

% --- Executes on button press in resume.
function resume_Callback(hObject, eventdata, handles)
% hObject      handle to resume (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global player;
resume(player)

% --- Executes on button press in stop.
function stop_Callback(hObject, eventdata, handles)
% hObject      handle to stop (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global player;
stop(player)

% --- Executes on slider movement.
function slider23_Callback(hObject, eventdata, handles)
% hObject      handle to slider23 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'Value') returns position of slider
%        get(hObject,'Min') and get(hObject,'Max') to determine range of
slider

% --- Executes on button press in save.
function save_Callback(hObject, eventdata, handles)
% hObject      handle to save (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global player;
global Y;
global Fs;
global FsO;

```



```

audiowrite('Project_Output.wav',Y,Fs0);

% --- Executes on button press in plot.
function plot_Callback(hObject, eventdata, handles)
% hObject      handle to plot (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global filename;
global Y;
global X;
global Fs;
global Fs0;
global g1;
global g2;
global g3;
global g4;
global g5;
global g6;
global g7;
global g8;
global g9;
global y1;
global y2;
global y3;
global y4;
global y5;
global y6;
global y7;
global y8;
global y9;
global N;
global t1;
global t2;
global f;
Y=g1*y1+g2*y2+g3*y3+g4*y4+g5*y5+g6*y6+g7*y7+g8*y8+g9*y9;
[X,Fs]=audioread(filename);
N=length(X);
t1=linspace(0,N/Fs,N);
t2=linspace(0,N/Fs0,N);
f=linspace(-Fs/2,Fs/2,N);
F=fftshift(fft(X/Fs));
Z=fftshift(fft(Y/Fs));
figure()
subplot(3,2,1)
plot(t1,X);
title('Input Signal');
xlabel('Time');
ylabel('Magnitude');
grid on;
subplot(3,2,2)
plot(t2,Y);
title('Output Signal');
xlabel('Time');
ylabel('Magnitude');
grid on;

```

```

subplot(3,2,3)
plot(f,abs(F));
xlabel('Frequency');
ylabel('Magnitude');
grid on;
subplot(3,2,4)
plot(f,abs(Z));
xlabel('Frequency');
ylabel('Magnitude');
grid on;
subplot(3,2,5)
plot(f,angle(F));
xlabel('Frequency');
ylabel('Phase');
grid on;
subplot(3,2,6)
plot(f,angle(Z));
xlabel('Frequency');
ylabel('Phase');
grid on;

```

```

% --- Executes during object creation, after setting all properties.
function filtertype_CreateFcn(hObject, eventdata, handles)
% hObject    handle to filtertype (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

```

```

% Hint: listbox controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

```

```

% --- Executes on selection change in popupmenu1.
function popupmenu1_Callback(hObject, eventdata, handles)
% hObject    handle to popupmenu1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns popupmenu1
%         contents as cell array
%         contents{get(hObject,'Value')} returns selected item from popupmenu1

```

```

% --- Executes during object creation, after setting all properties.
function popupmenu1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to popupmenu1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

```

```

% Hint: popupmenu controls usually have a white background on Windows.
%       See ISPC and COMPUTER.

```

```

if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton9.
function pushbutton9_Callback(hObject, eventdata, handles)
% hObject      handle to pushbutton9 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)
global filename;
global Y;
global X;
global Fs;
global Fs0;
global num1;
global num2;
global num3;
global num4;
global num5;
global num6;
global num7;
global num8;
global num9;
global den1;
global den2;
global den3;
global den4;
global den5;
global den6;
global den7;
global den8;
global den9;
global g1;
global g2;
global g3;
global g4;
global g5;
global g6;
global g7;
global g8;
global g9;
global y1;
global y2;
global y3;
global y4;
global y5;
global y6;
global y7;
global y8;
global y9;
global N;
global t1;
global t2;
global f;

```

```

Y=g1*y1+g2*y2+g3*y3+g4*y4+g5*y5+g6*y6+g7*y7+g8*y8+g9*y9;
v=get(handles.popupmenu1,'Value');
switch (v)
    case 1
        out=y1;
        a=den1;
        b=num1;
    case 2
        out=y2;
        a=den2;
        b=num2;
    case 3
        out=y3;
        a=den3;
        b=num3;
    case 4
        out=y4;
        a=den4;
        b=num4;
    case 5
        out=y5;
        a=den5;
        b=num5;
    case 6
        out=y6;
        a=den6;
        b=num6;
    case 7
        out=y7;
        a=den7;
        b=num7;
    case 8
        out=y8;
        a=den8;
        b=num8;
    case 9
        out=y9;
        a=den9;
        b=num9;
end
OUT=fftshift(fft(out/Fs));
N=length(X);
t2=linspace(0,N/Fs0,N);
f=linspace(-Fs/2,Fs/2,N);
axes(handles.axes1);
plot(t2,out);
title('Time Domain');
xlabel('Time');
ylabel('Magnitude');
axis tight;
zoom on;
grid on;
axes(handles.axes2);
plot(f,abs(OUT))
title('Frequency Domain');
xlabel('Frequency');
ylabel('Magnitude');

```

```

axis tight;
zoom xon;
grid on;
axes(handles.axes3);
plot(f,angle(OUT))
xlabel('Frequency');
ylabel('Phase');
axis tight;
zoom xon;
grid on;
TF = tf(b,a);
figure();
title('Magnitude and Phase');
freqz(b,a,N);
figure();
title('Filter Analysis');
subplot(3,1,1);
pzmap(TF);
grid on;
subplot(3,1,2);
impz(TF);
grid on;
subplot(3,1,3);
step(TF);
grid on;
[z,p,k] = tf2zp(b,a);
fprintf('\nGain = %d\n',k);

```

```

function edit12_Callback(hObject, eventdata, handles)
% hObject      handle to edit12 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit12 as text
%         str2double(get(hObject,'String')) returns contents of edit12 as a
double

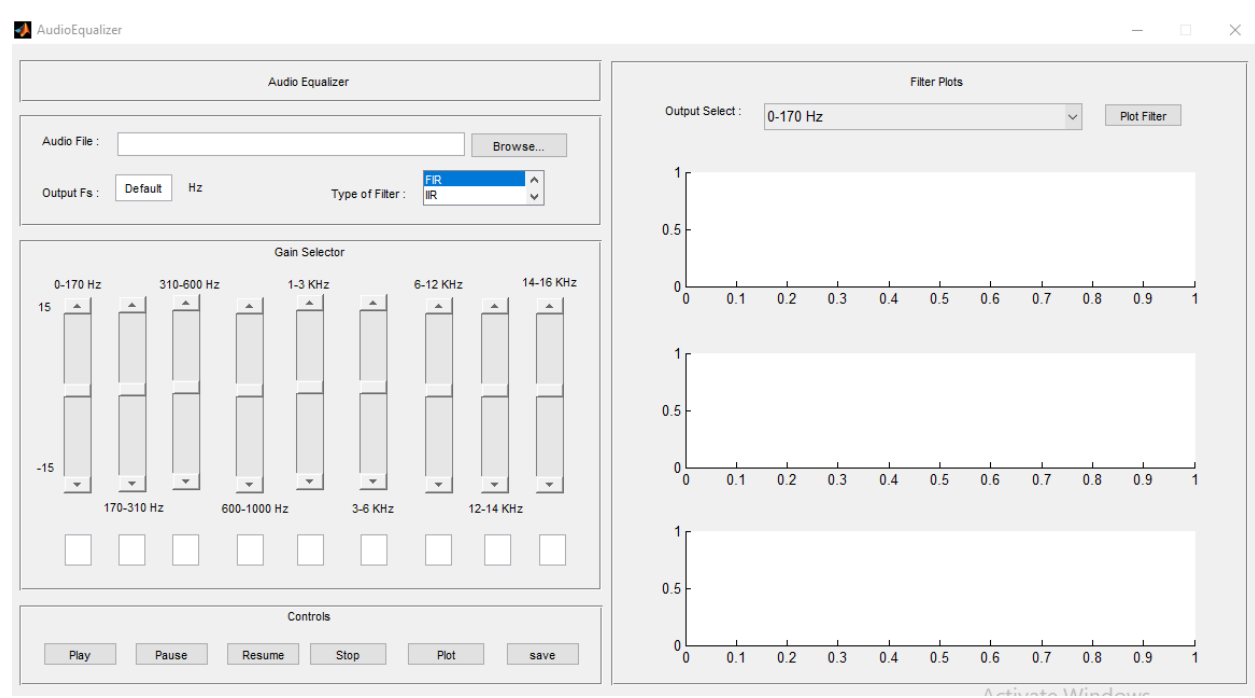
```

```

% --- Executes during object creation, after setting all properties.
function edit12_CreateFcn(hObject, eventdata, handles)
% hObject      handle to edit12 (see GCBO)
% eventdata    reserved - to be defined in a future version of MATLAB
% handles      empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%         See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

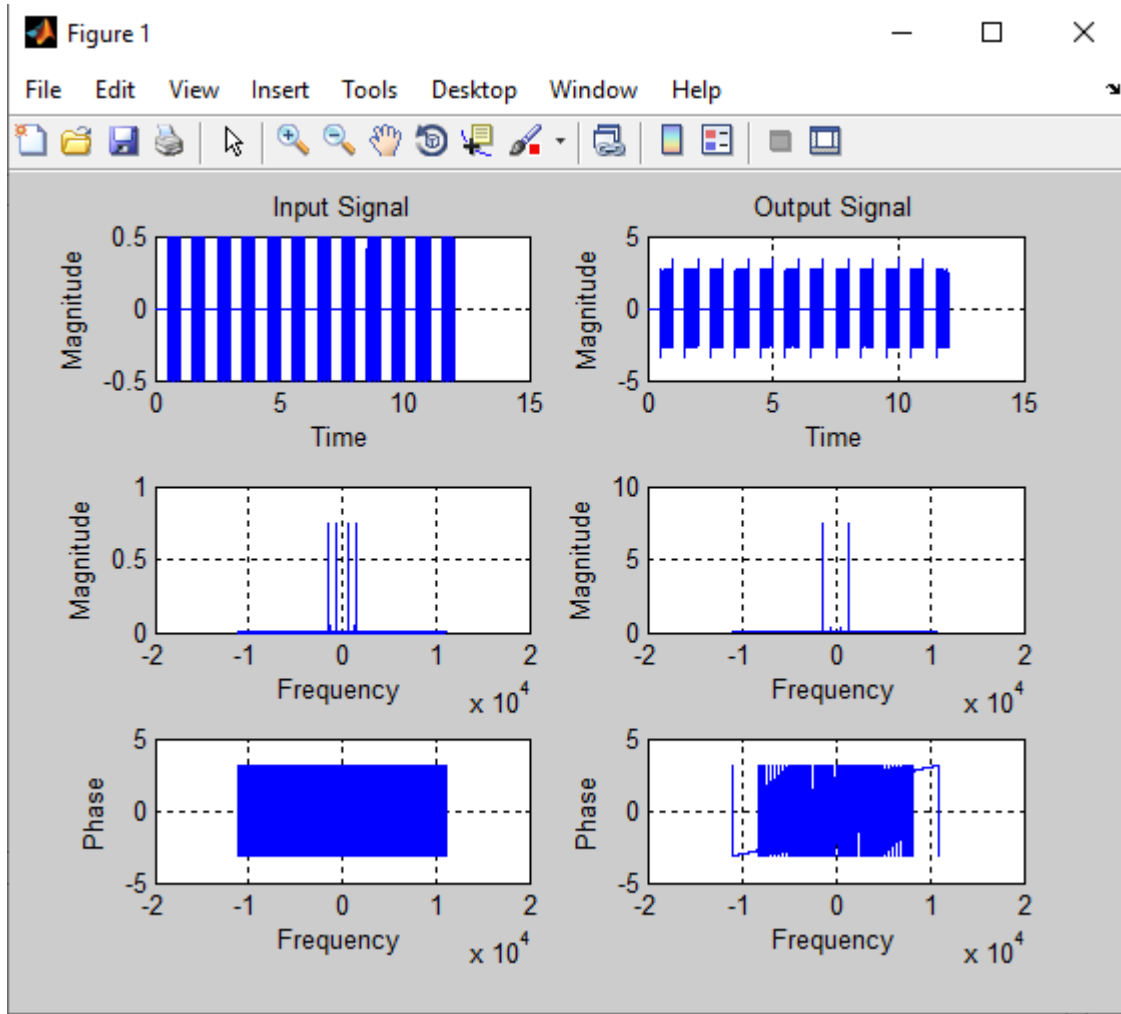
```

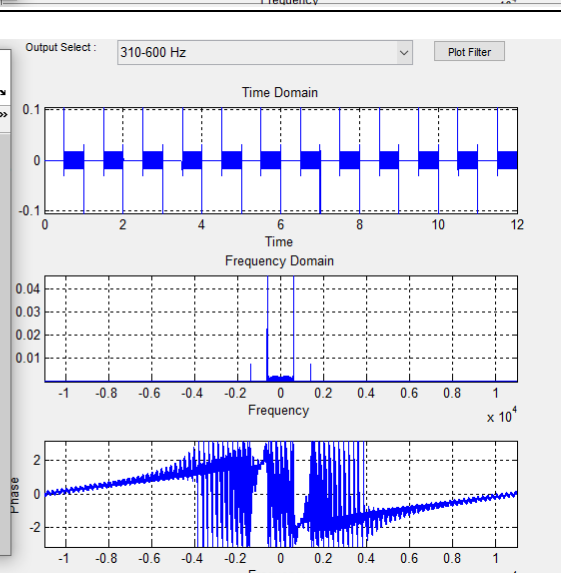
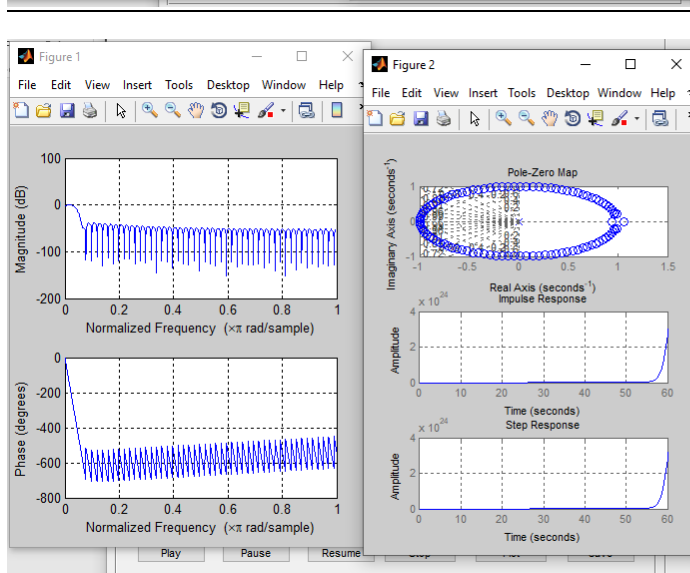
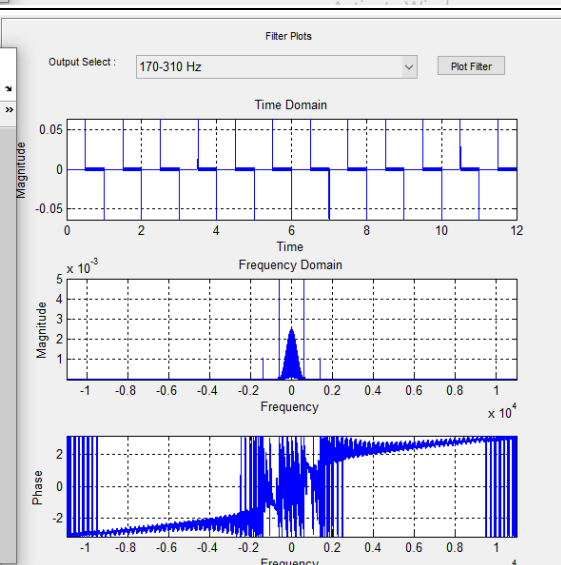
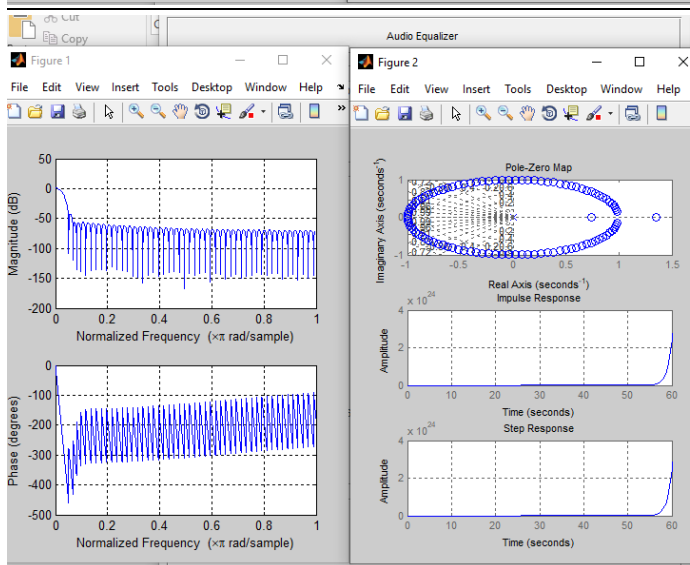
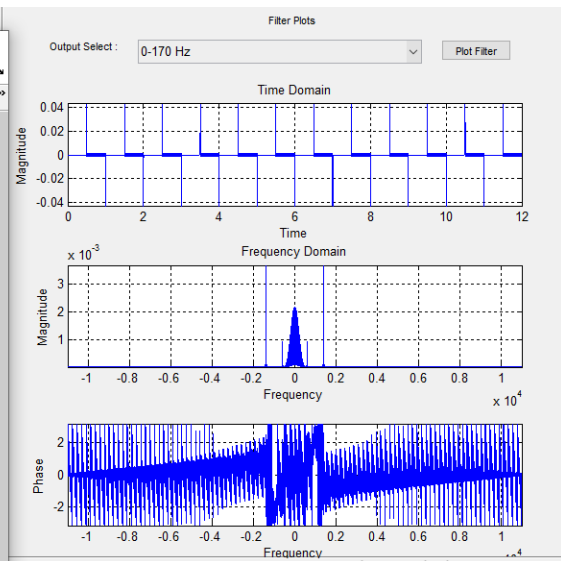
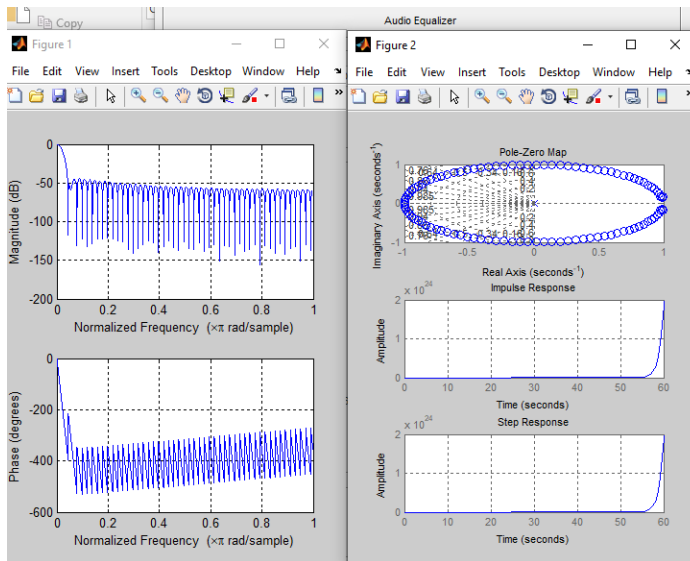
 AudioEqualizer

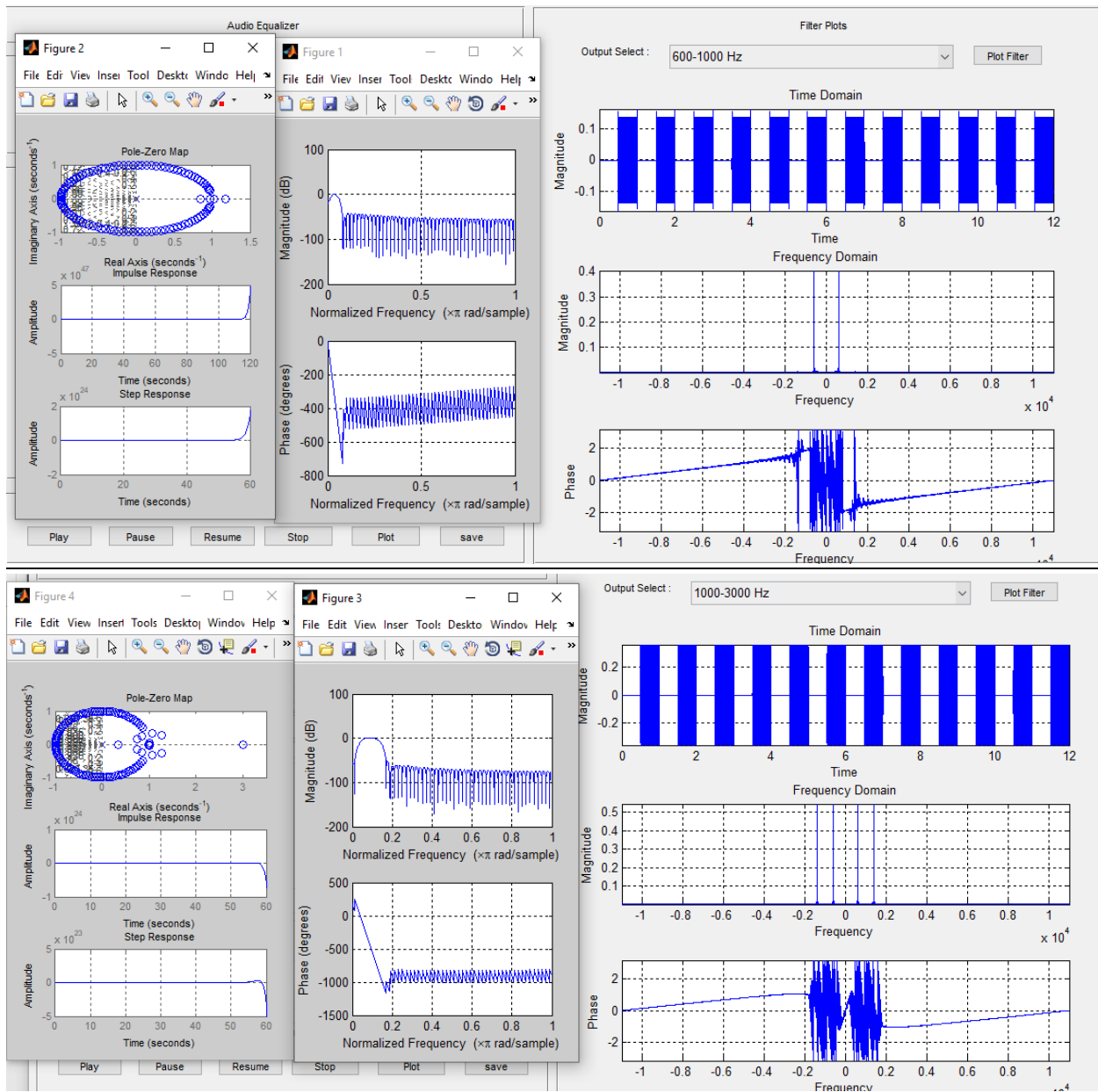
OUTPUT EXAMPLES:

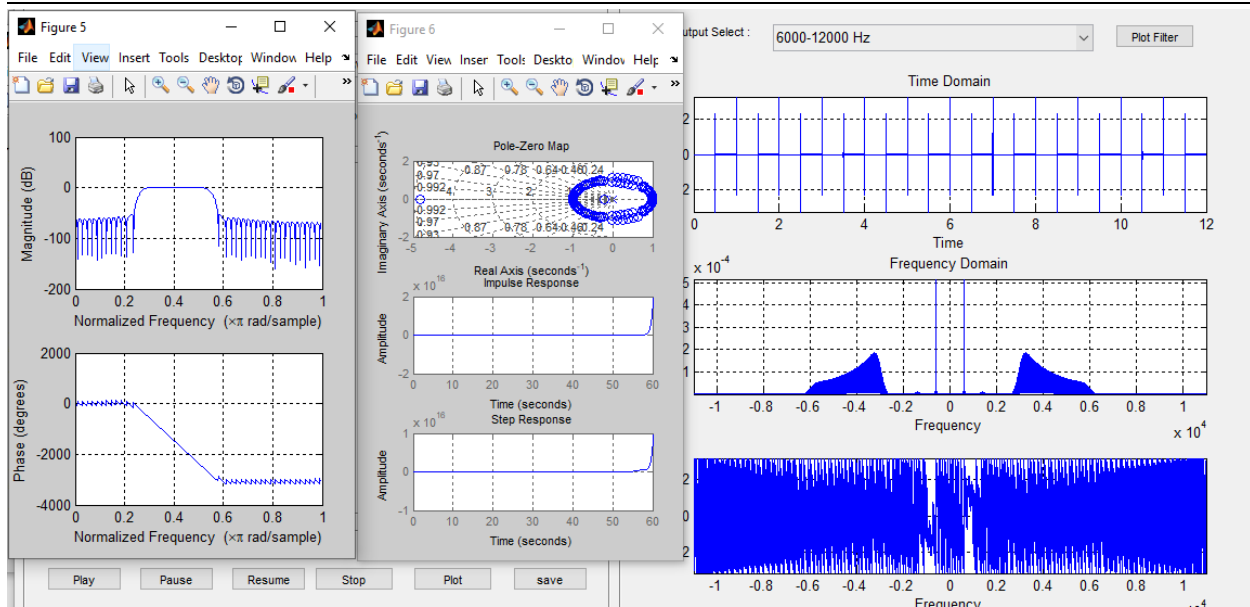
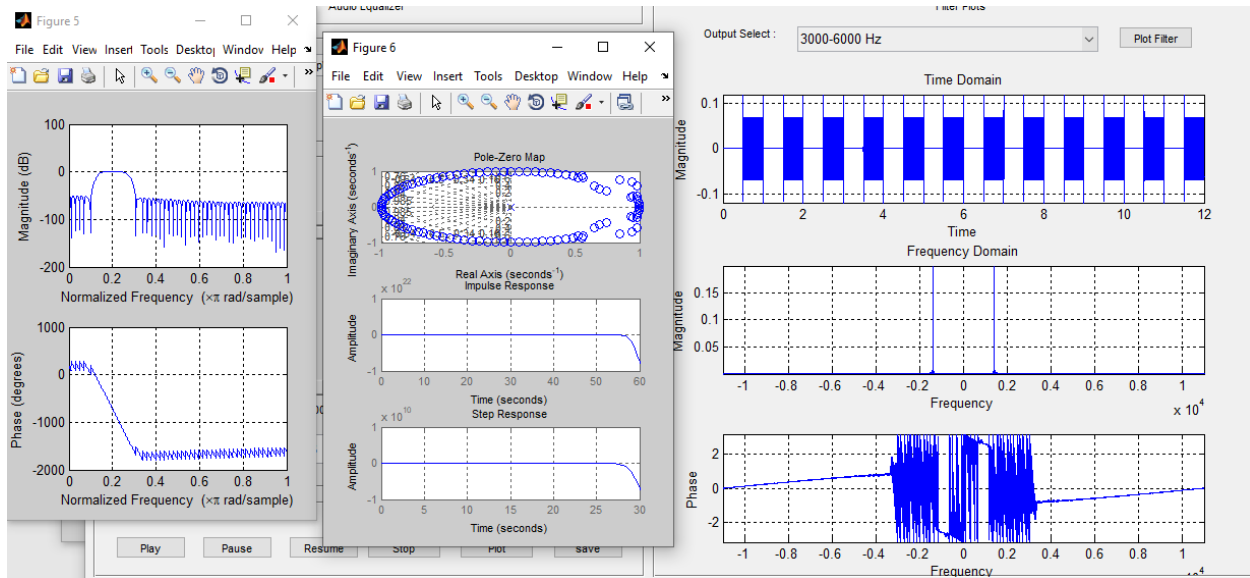
AUDIO FILE USED IS A DIALING TONE SIGNAL (BEEPING SIGNAL)

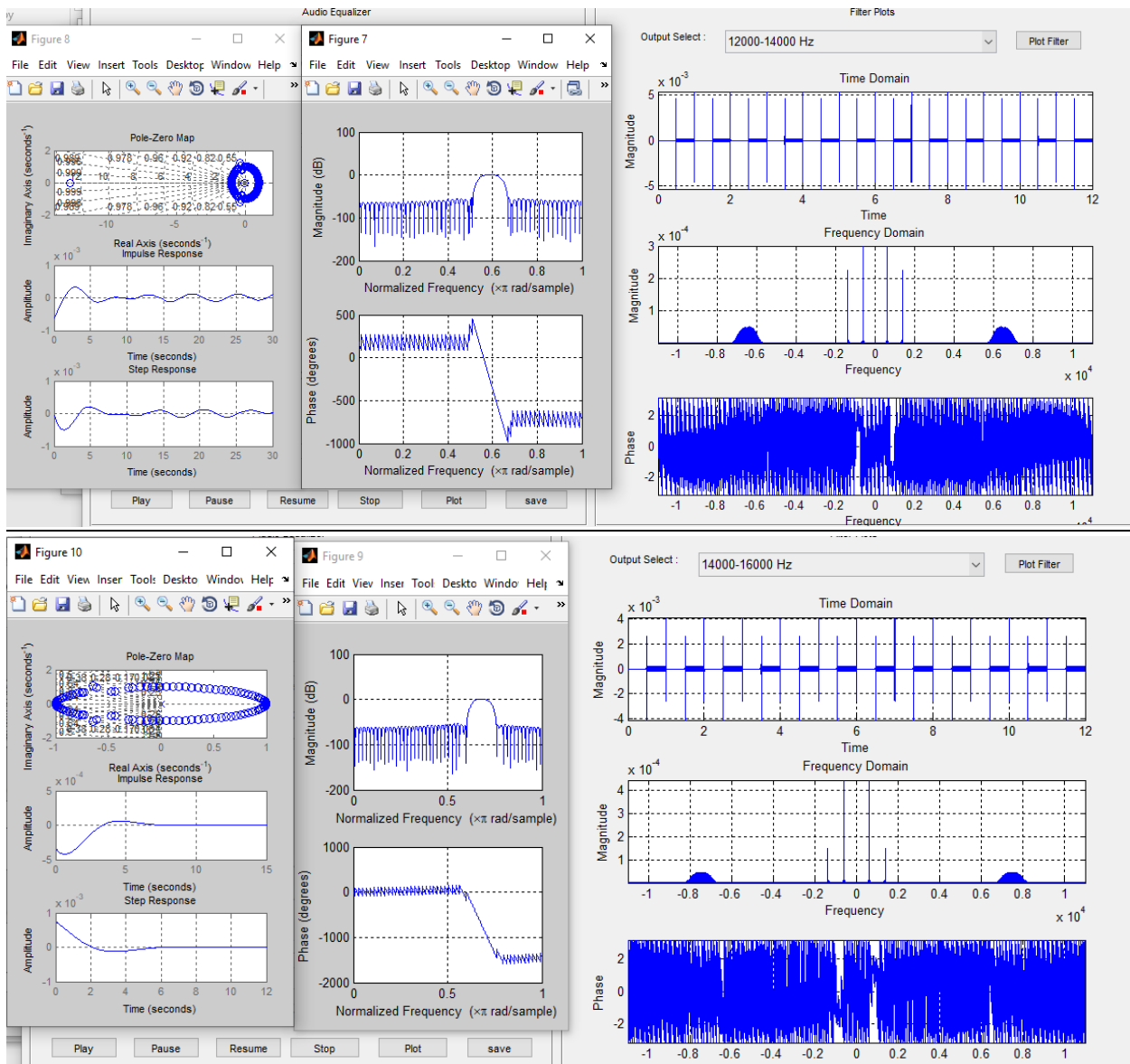
WITH FIR FILTERS, FS IS DEFAULT 22050 HZ, SLIDERS RANDOMLY ADJUSTED:



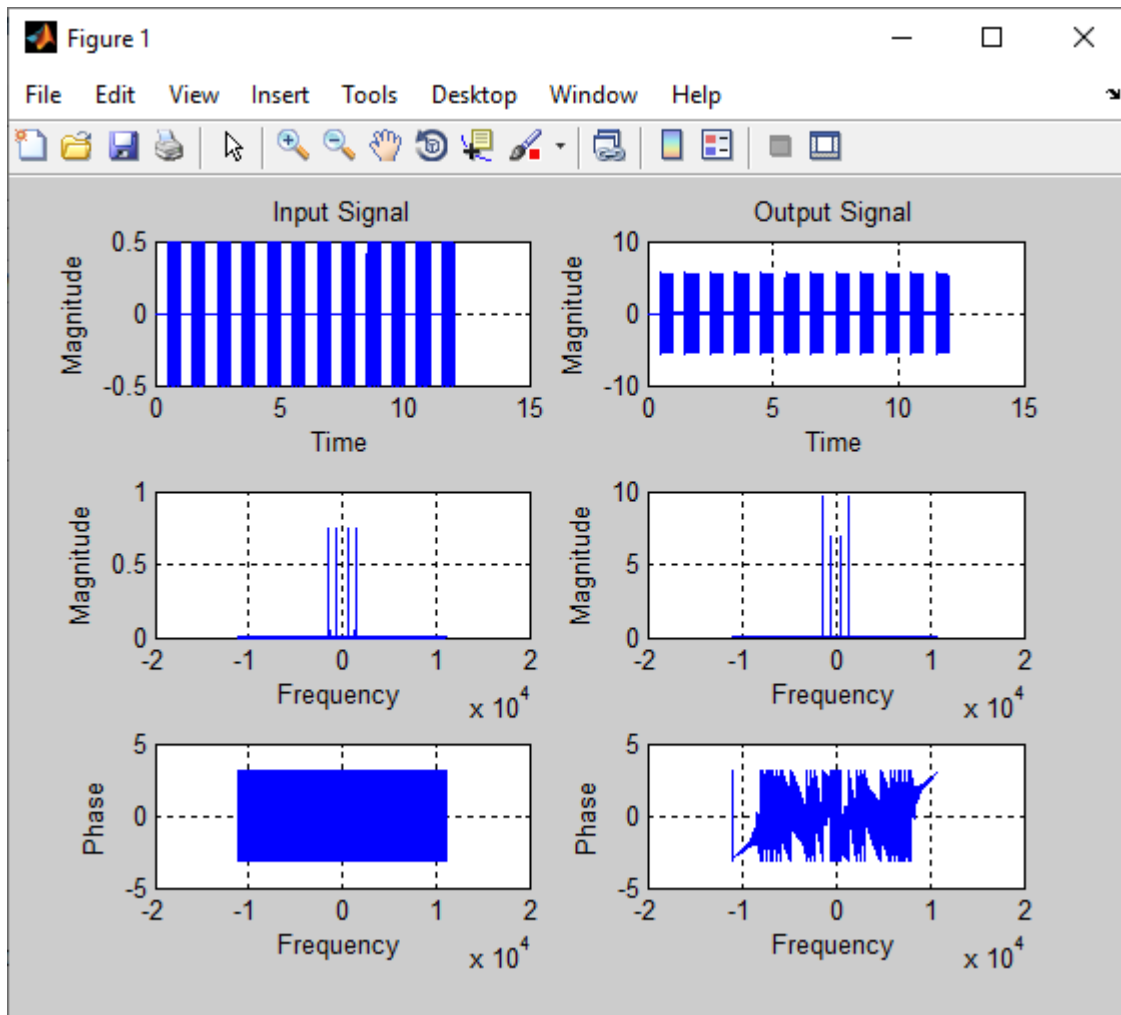


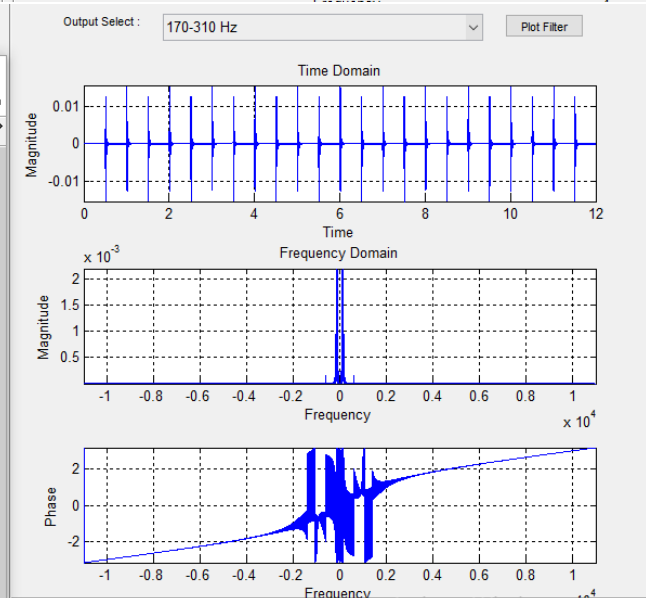
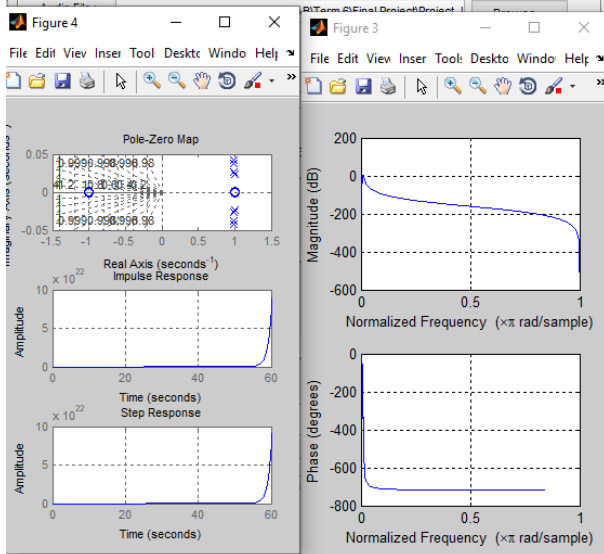
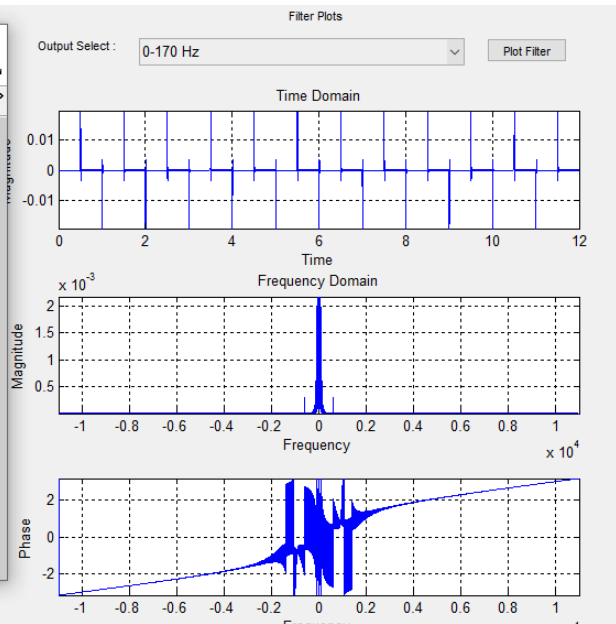
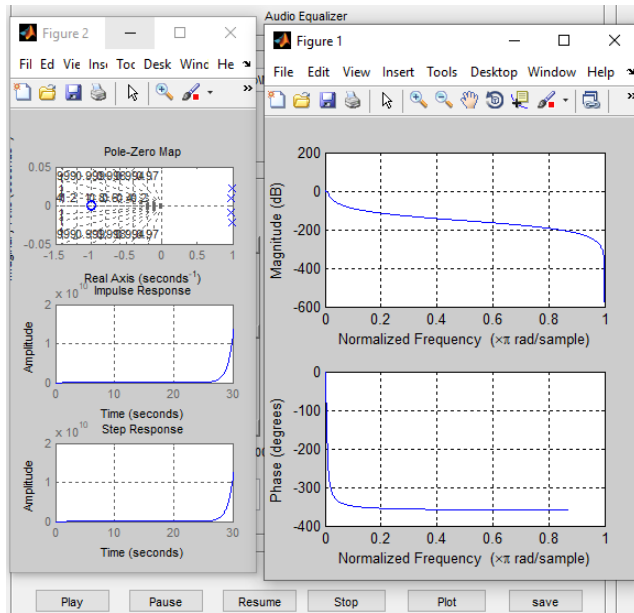


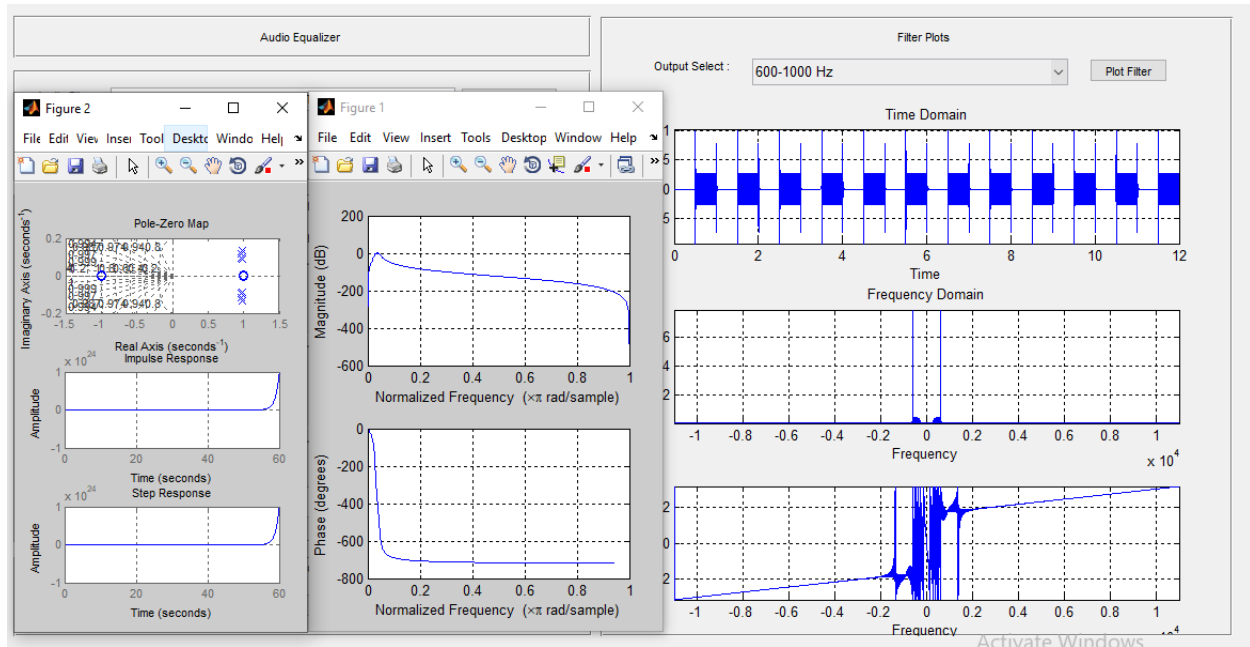
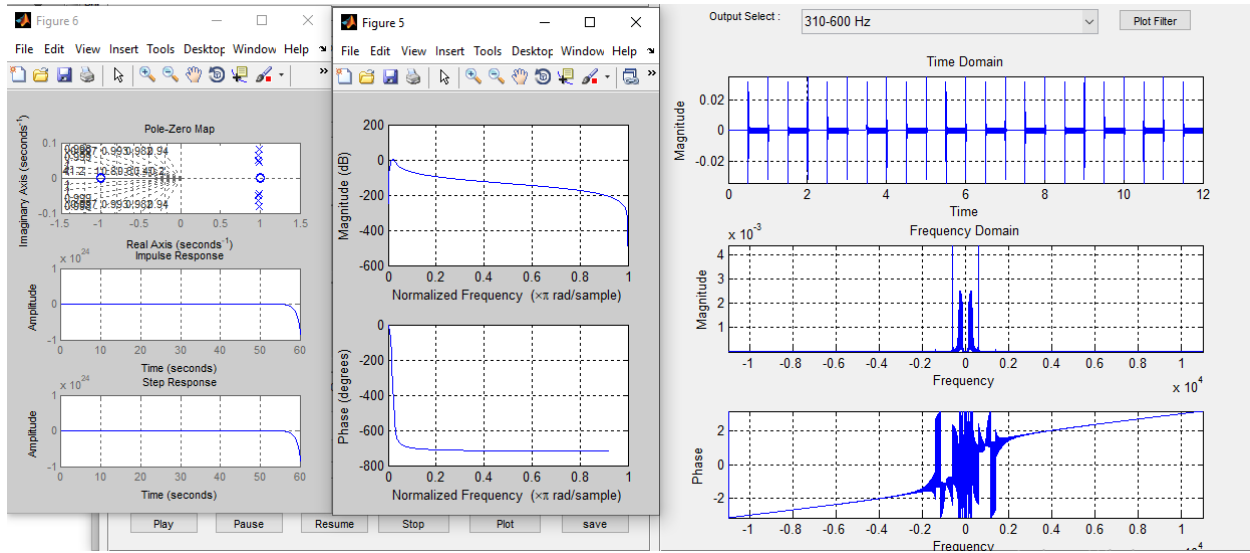


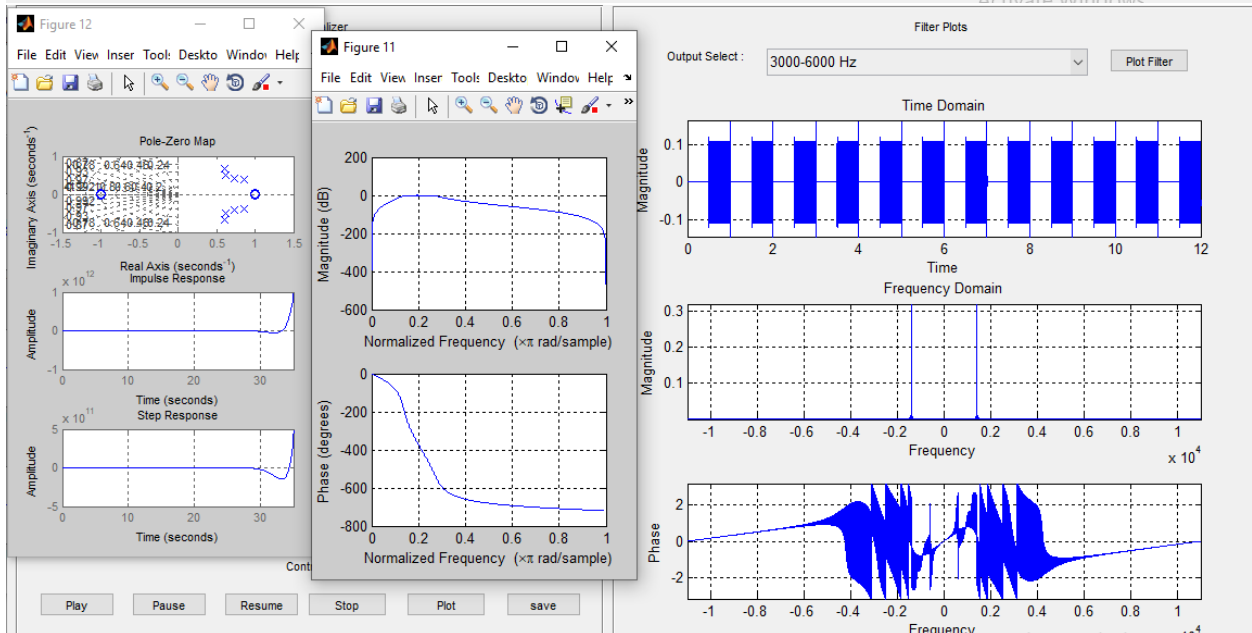
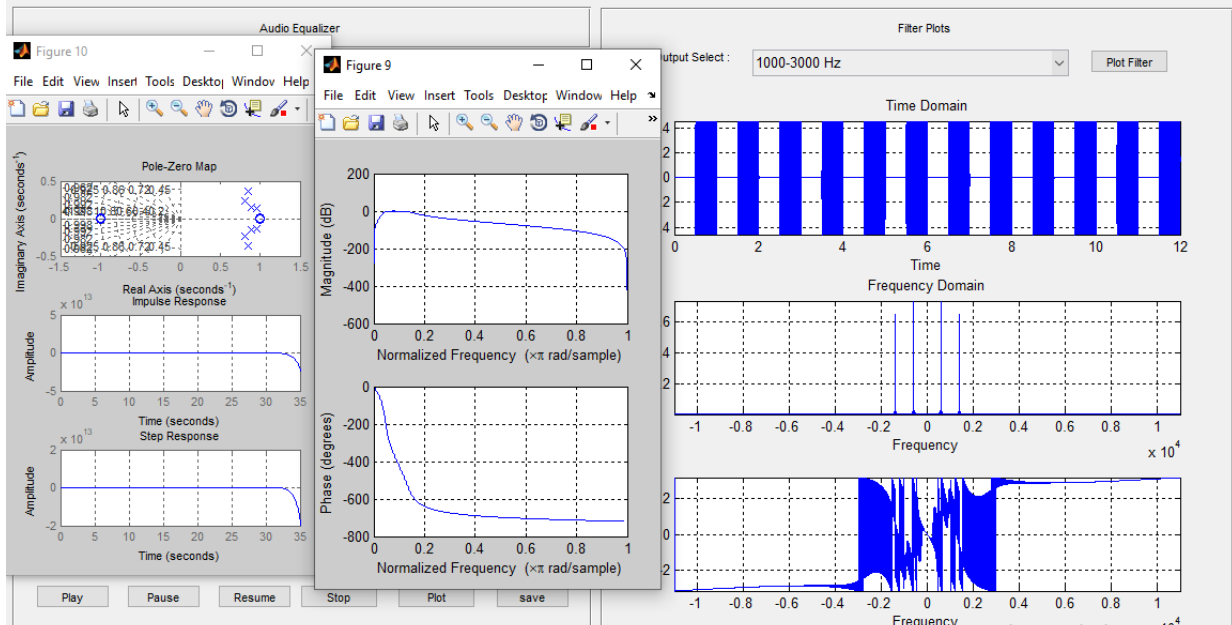


WITH IIR FILTERS, FS IS DOUBLED TO 44100 HZ, SLIDERS LEFT AS DEFAULT:

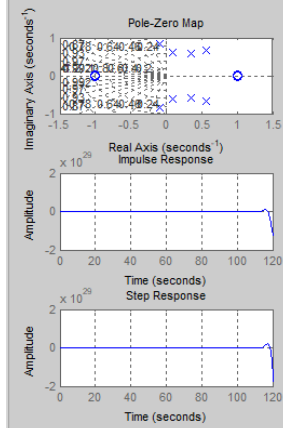








File Edit View Insert Tools Desktop Window Help



Controls

Play Pause Resume Stop Plot save

Figure 13

File Edit View Insert Tools Desktop Window Help

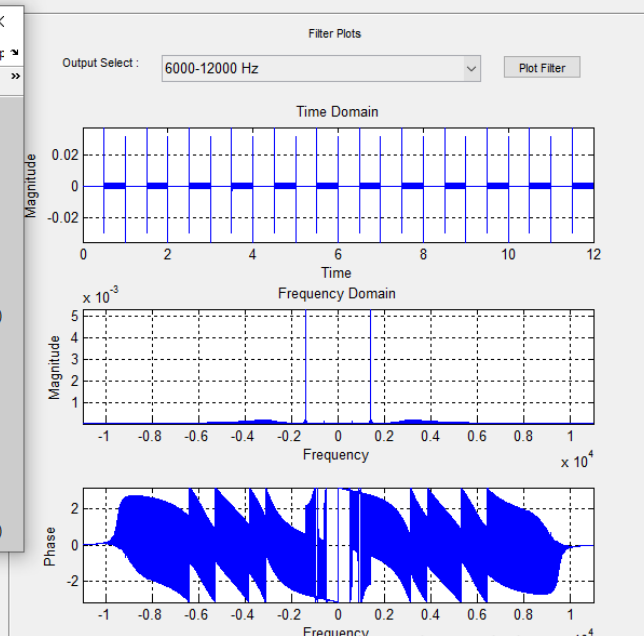
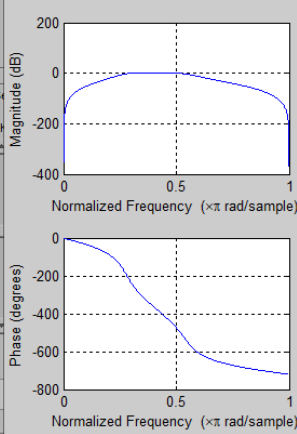
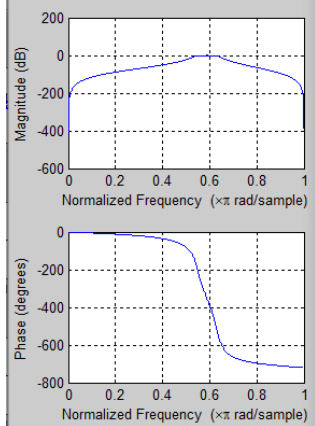


Figure 15

File Edit View Insert Tools Desktop Window Help

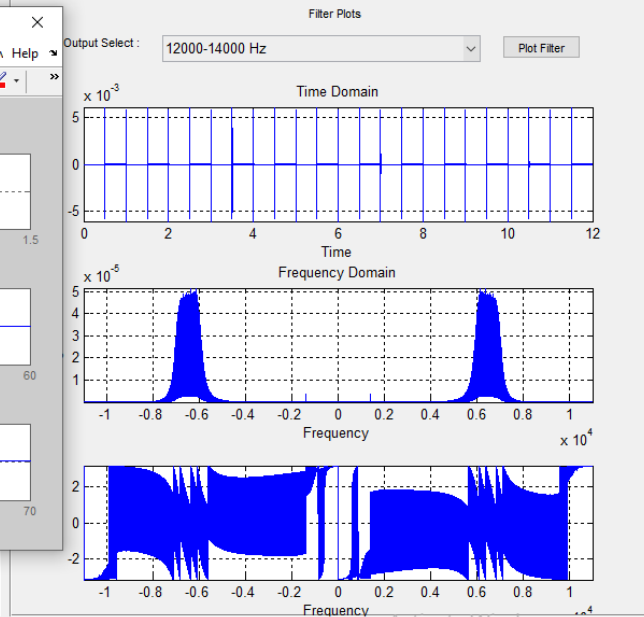
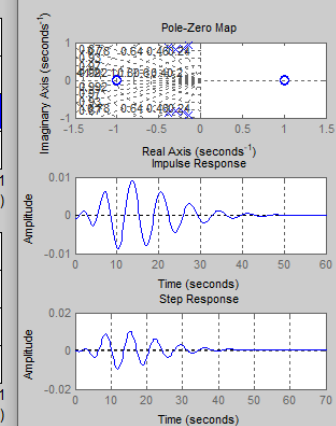


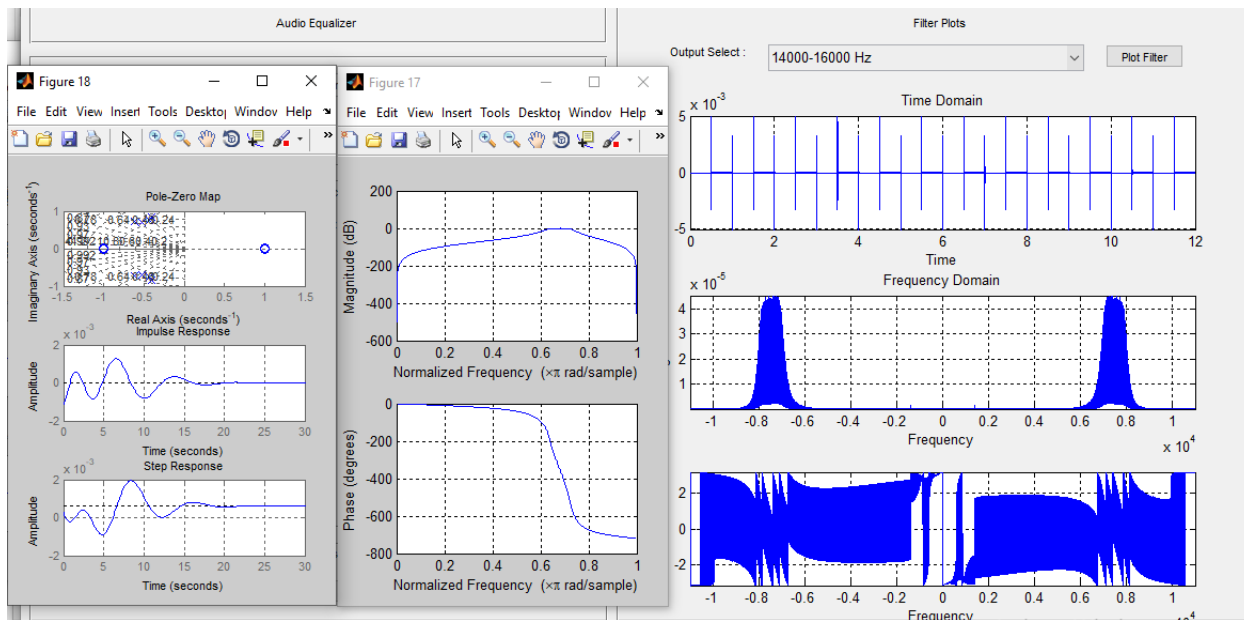
Controls

Play Pause Resume Stop Plot save

Figure 16

File Edit View Insert Tools Desktop Window Help





WITH FIR FILTERS, FS IS HALVED TO 11025 HZ, SLIDERS LEFT AS DEFAULT:

