8.In write_sin_01.py, can you set the number of channels to be more than 2? Use Python to generate a wav file with more than two channels, with different waveforms for each channel. Read the wav file into MATLAB and plot the individual channels (zoom in if necessary to show the waveforms). Submit your Python code, MATLAB code, comments, and MATLAB plot saved as a pdf file.

Python code: 3channels.py

```
# set the number of channels to be more than 2
from struct import pack
from math import pi, sin
import wave
fs = 16000
wf = wave.open('3channels.wav','w')
#3 channels
wf.setnchannels(3)
#32 bits per sample - 4 bytes
wf.setsampwidth(4)
#frequency I choosed is 16000Hz
wf.setframerate(fs)
#32 bits - 0~1
maxAmp = 2**31 - 1.0
f = 200
for n in range(0, int(0.5*fs)):
#'B'-unsigned 8-bit wav and it standard size is 1
#first channel
    binary_string = pack('i', maxAmp*sin(n*2*pi*f/fs))
#second channel
    binary_string += pack('i', 8000)
#third channel
    binary_string += pack('i', n)
    wf.writeframesraw(binary_string)
wf.close()
```

MATLAB code: individual.m

```
clear
[x,fs] = audioread('3channels.wav');

subplot(2,2,1)
plot(x(:,1))
xlim([0,100])
xlabel('Time (sample)')
title('channel 1')

subplot(2,2,2)
plot(x(:,2))
xlim([0,100])
xlabel('Time (sample)')
title('channel 2')

subplot(2,2,3)
plot(x(:,3))
xlim([0,100])
xlabel('Time (sample)')
title('channel 3')

print -dpdf plot_of_3_individual_channels
```

MATLAB plot: plot_of_3_individual_channels.pdf

written comments:

At the beginning, I used unsigned 8-bit (1 byte) to create the wave file with 3 sin wav, and used 3 different value f1=200, f2=400, f3=600 to change the frequency. However I saw that we need to create 3 different wave form. Then I modified the code and came to this new version.

I used signed 32-bit since it became error when i put waveform 'n' in the third channel, it show that it is over 255(2^8-1), I guess it may work well with $2^{(32-1)}$.

In order to output the figure individual, we could use `plot(x(:,n))`to get part

of the string and slim() could help us see the waveform clearly without zoom in and zoom out.

Plus, I still have question on the python, that I make a waveform 8000 in channel 2, but why is show me zero when plot. Also I use n in the 3 channel and it show me 5^{-8} in the ylabel, what make it such small?