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Electrical Engineering 3TP3
Lab 4

*All files are clickable link that will open through onedrive and to access each link hold crtl and click.

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Part 1:
Q1

tones2020.wav

Q2

I hear a high pitch note and a quiter lower tone note whitch is oscilating a little bit. The lower tone note is a hard to recognize at first, but once I did I could choose to hear it or not. This is consitent through the whole audio, which is 10 seconds long and to hear the same thing I did, crtl+click on the wav file above.
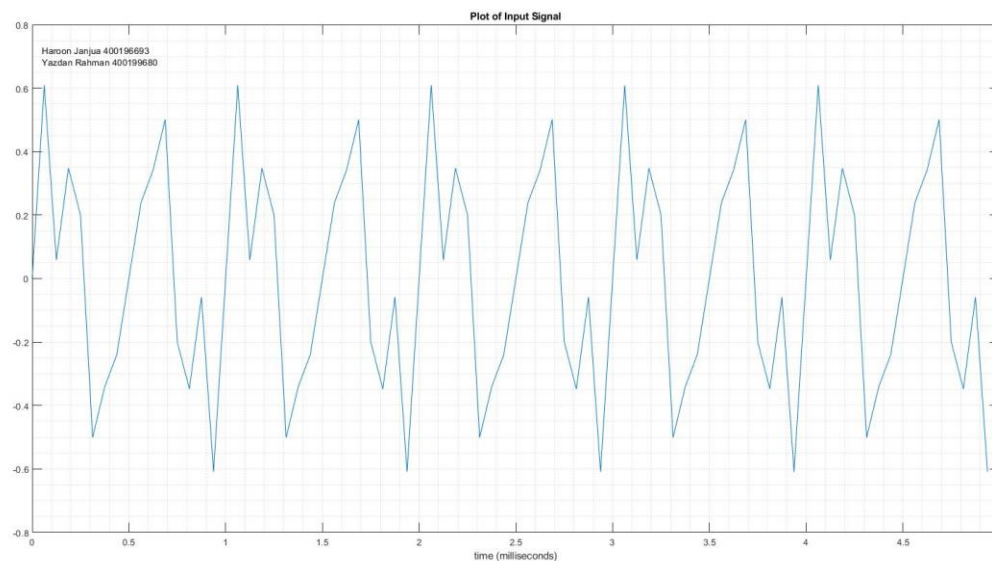
Q3
Matlab

Q3.m

Output

Q4

Based on the output of Q3 I would estimate there be 2 or 3 different frequencies, because in 1 period length, 1 second, there are 4 spikes, the first 2 look like they belong to the same peak while the next 2 look like they may or maynot be within the same peak. For this reason I believe there can be either 2 or 3 frequencies, however I would guess there are 3 frequency since the sound played by the audio sounded like a high pitch noise and a lower pitch noise that osscilated. I belive this osscilation may represent another frequecny.
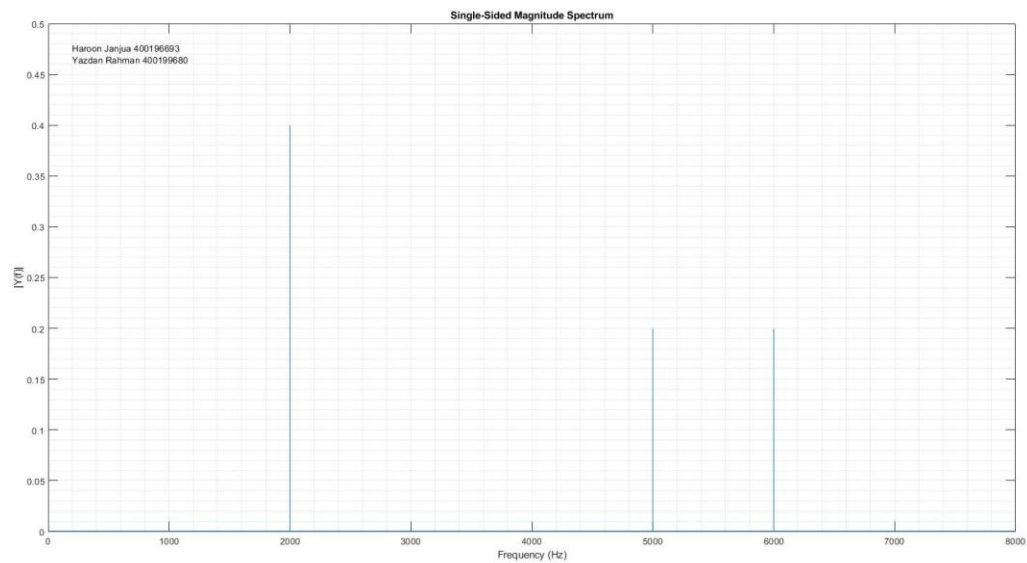
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Q5

Matlab

Q5.m

Output

Single-Sided Magnitude Spectrum

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(plot: x-axis "Frequency (Hz)" from 0 to 8000, y-axis "|Y(f)|" from 0 to 0.5; peaks at 2000Hz ≈ 0.4, 5000Hz ≈ 0.2, 6000Hz ≈ 0.2)

Q6

Sinusoids	Frequecies (f)	Amplitudes (A)
1	2000Hz	0.4
2	5000Hz	0.2
3	6000Hz	0.2

Q7

Matlab

Q7.m

Output

Plot of Input Signal

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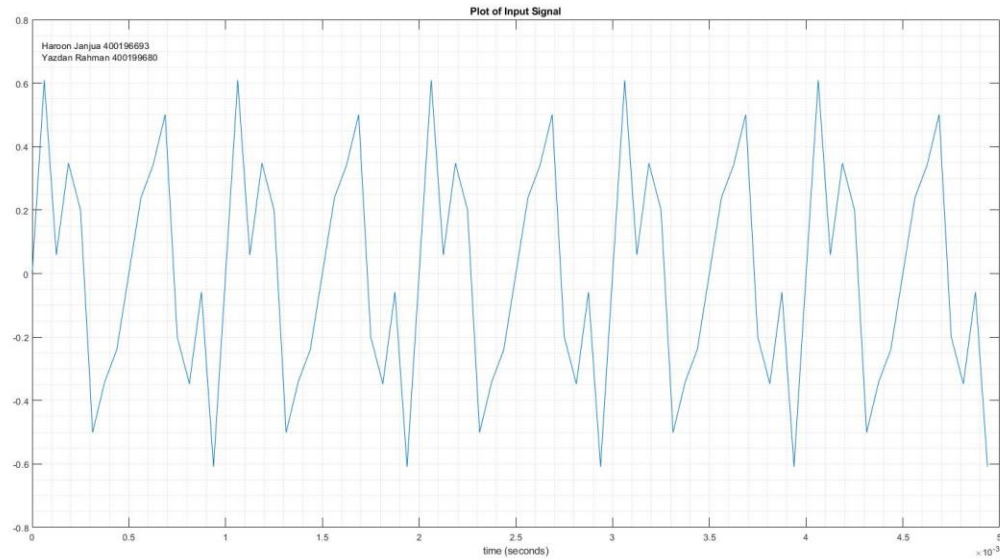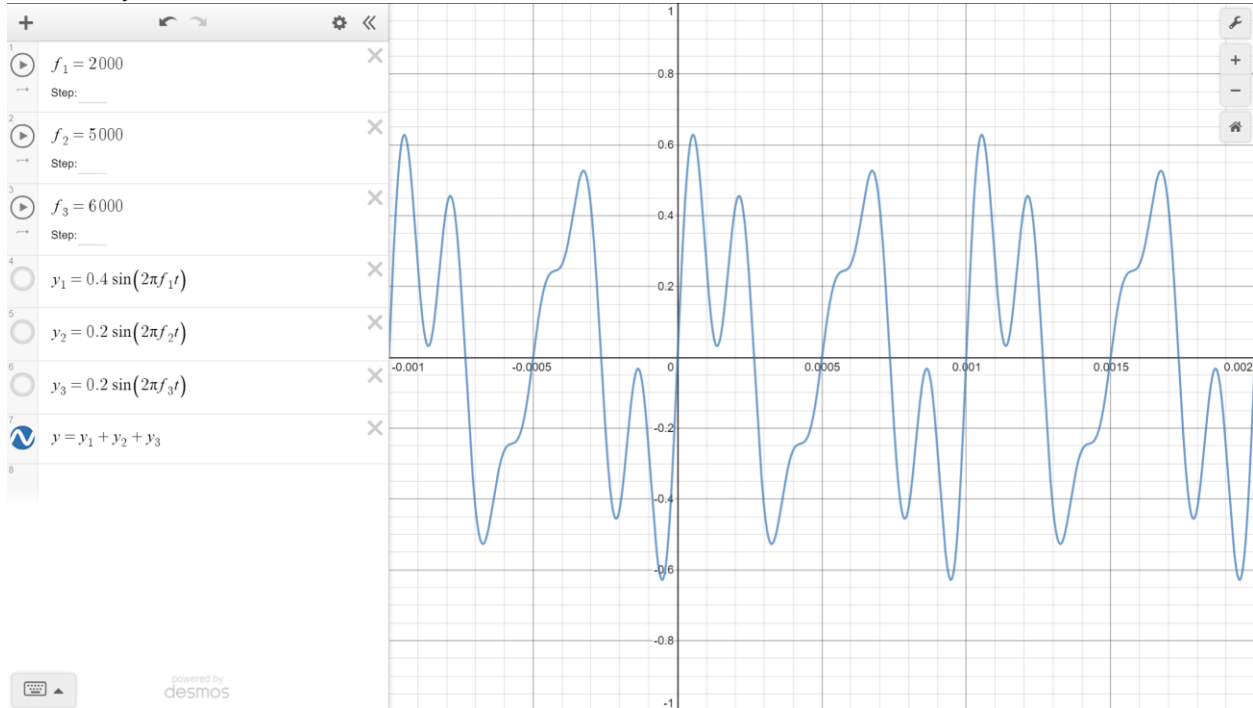## *Discussion*

It looks the exact same as the output from Q3, but if I had set Fs to anything different than it would have looked more fluid and defined. If we look at the continuous output we can see what I mean. This is also the reason why in Q4 it may look like there are only 2 frequencies when there is actually 3.

$f_1 = 2000$

$f_2 = 5000$

$f_3 = 6000$

$y_1 = 0.4 \sin(2\pi f_1 t)$

$y_2 = 0.2 \sin(2\pi f_2 t)$

$y_3 = 0.2 \sin(2\pi f_3 t)$

$y = y_1 + y_2 + y_3$

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Part 2:

Q1

SecretMessage2020
.wav

Q2

When listnening to the audio file it is almost impossible to hear the different notes that are being played. The notes are very quiet and in inadible due to the static noise that appears during the whole wav file. To see what I am talking about crtl+click on the wav file above.
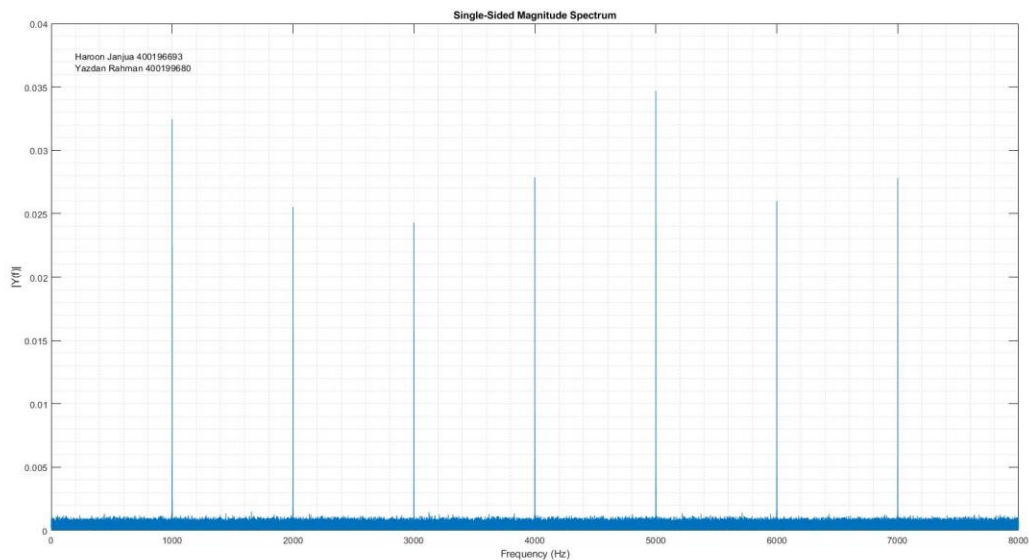
Q3

Matlab

Q3.m

Output

Discussion

The frequencies used in the SecretMessage2020.wav file are the following:

1000Hz	4000Hz	7000Hz
2000Hz	5000Hz	
3000Hz	6000Hz	

5000Hz being the most frequent and 3000Hz being the least.

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Q4
Matlab

Q4.m

Output

```
result =

    "IT DOES NOT MATTER HOW SLOWLY YOU GO AS LONG AS YOU DO NOT STOP."

fx >>
```

Discussion
The secret message was "It does not matter how slowly you go as long as you do not stop.", which is a great message and I agree. The way I approached this was by doing the DFT for every second and finding what 4 frequncies that where used. Then I compared the 4 frequencies with the codes that I stored in an excel file. Then I stored the corresponding symbol for each second of the signal, displaying it all at the end as a string.