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Sec:2

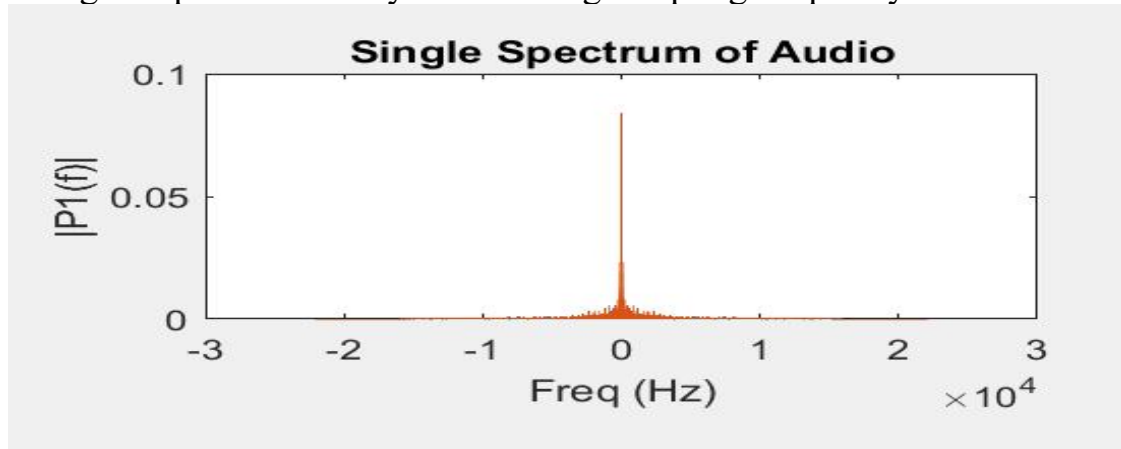
Matlab Project

Dr /: Ayman M. Hassan

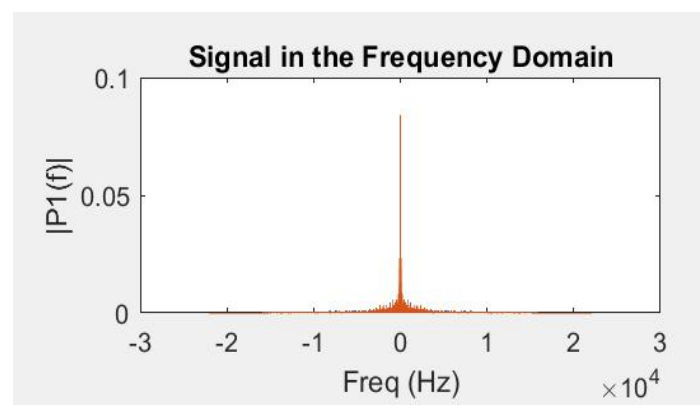
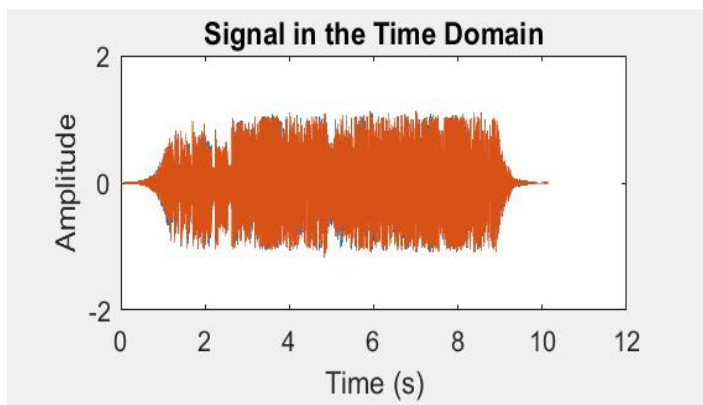
May 2023

PART 1

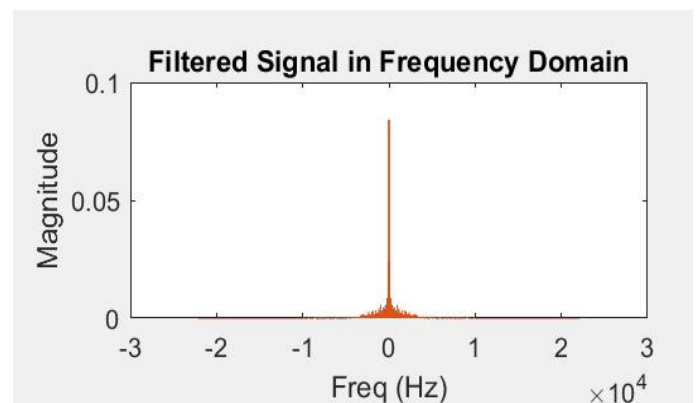
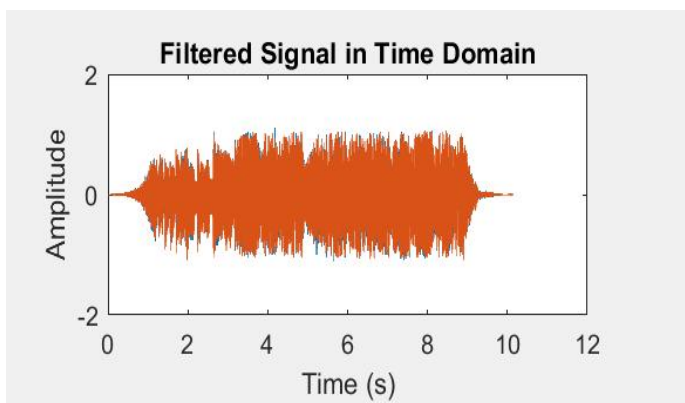
1- Signal Spectrum for my record using sampling frequency 48KHz



2- Signal in time domain and frequency domain

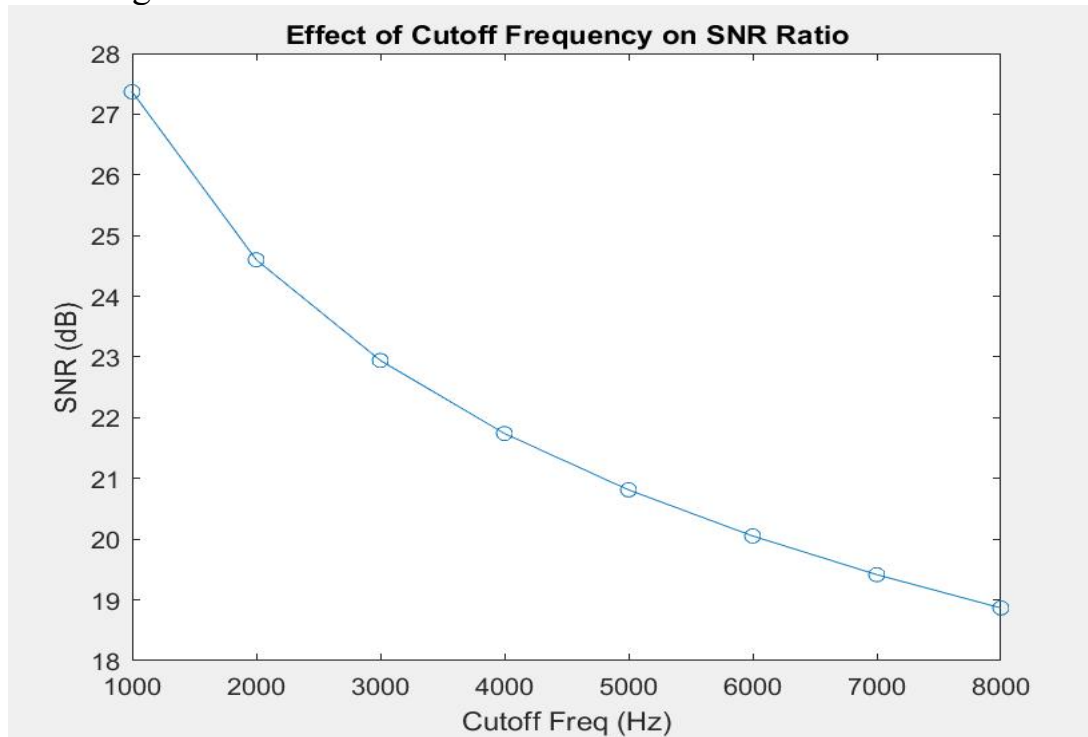


3- Filtered Signal (3.4 KHz) in time domain and frequency domain

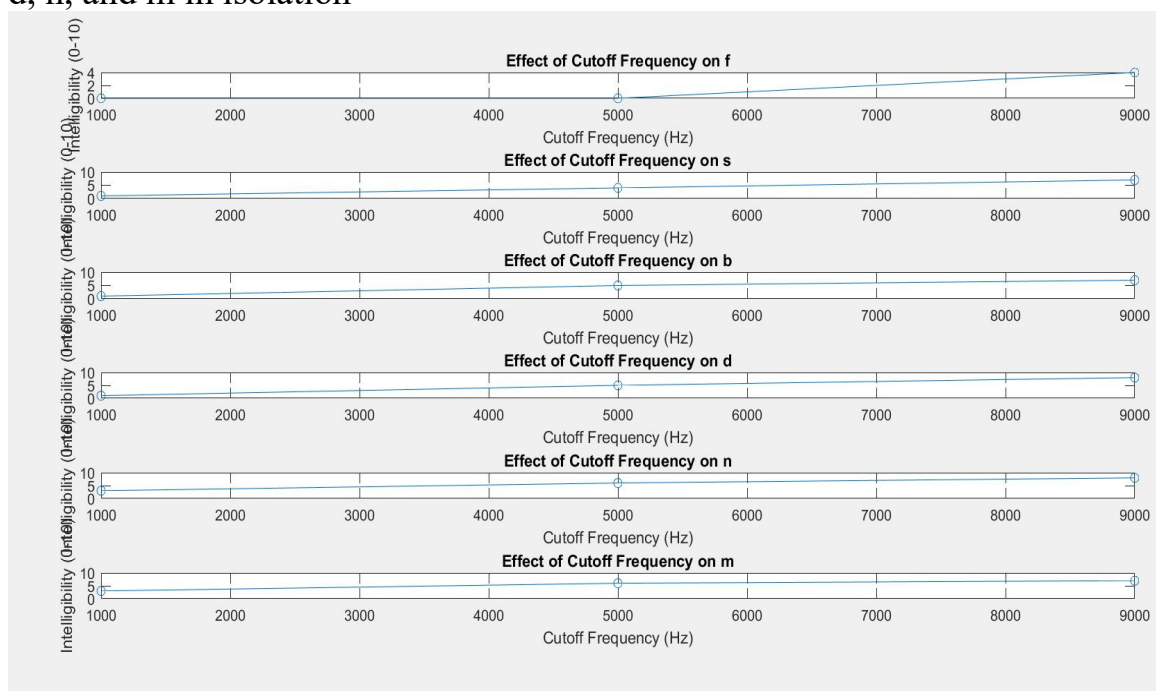


- When listening to the original recording and the filtered recording, I noticed the following: The sound in the filtered recording is somewhat muffled or focused.

4- Plotting of cutoff frequencies after which the signal becomes unintelligible



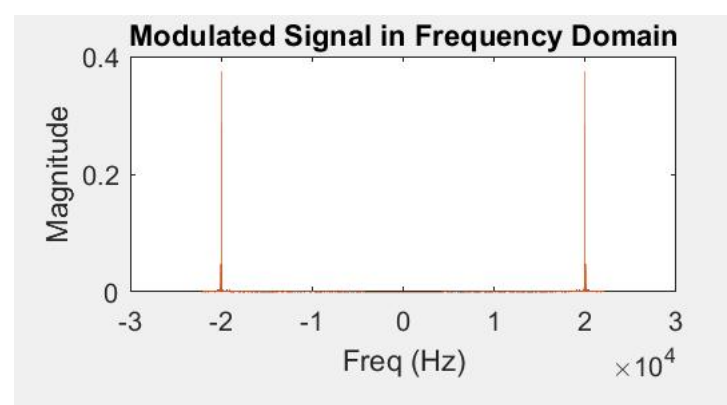
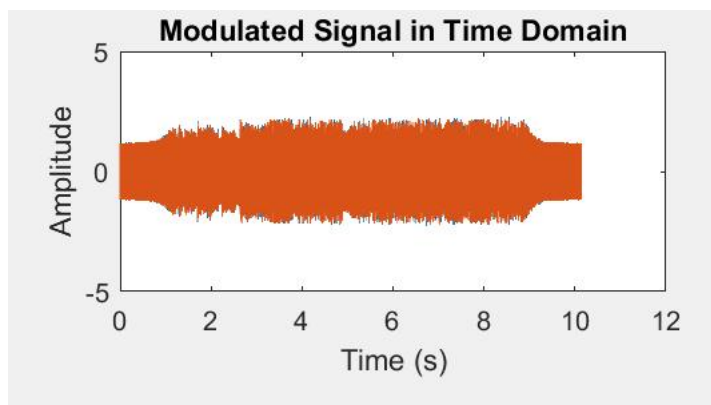
5- Plotting for segment of speech where you pronounce the sounds: f, s, b, d, n, and m in isolation



From the drawing shown above, we notice the following :

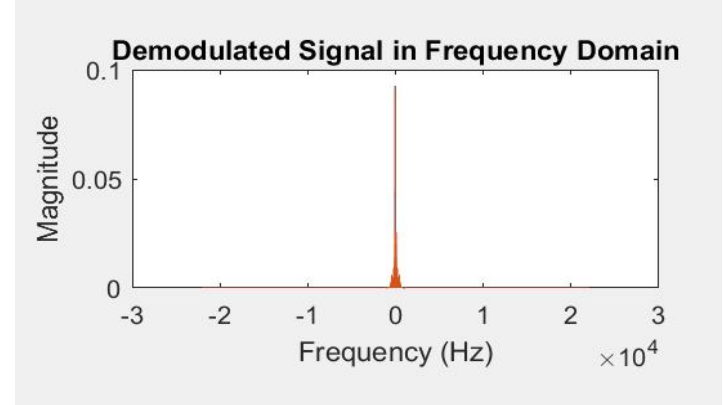
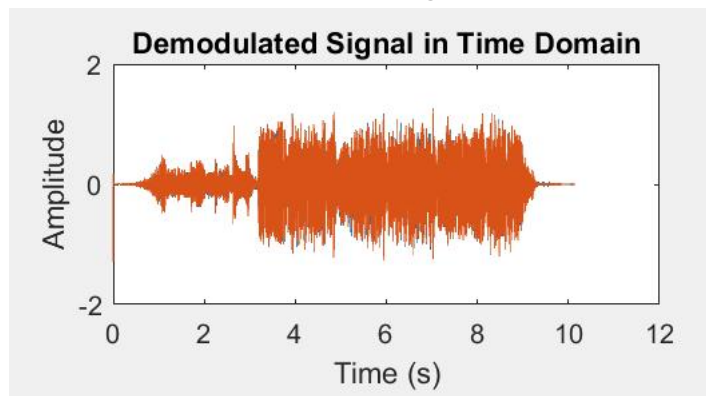
- (f): The degree of listening for a letter on a scale from 0 to 10 is **0 at 1KHz and 5Kz and 4 at 9KHz.**
- (s): The degree of listening to the letter on a scale from 0 to 10 is **1 at the 1KHz, 4 at the 5KHz, and 7 at the 9KHz.**
- (b): The degree of listening to the letter on a scale from 0 to 10 is **1 at the 1KHz, 5 at the 5KHz, and 7 at the 9KHz.**
- (d): The degree of listening to the letter on a scale from 0 to 10 is **1 at 1KHz, 5 at 5KHz, and 8 at 9KHz.**
- (n): The degree of listening to the letter on a scale from 0 to 10 is **3 at the 1KHz, 6 at the 5KHz, and 8 at the 9KHz.**
- (m): The degree of listening to the letter on a scale from 0 to 10 is **3 at the 1KHz, 6 at the 5KHz, and 7 at the 9KHz.**

6- Modulated signal and its spectrum (DSB-LC).

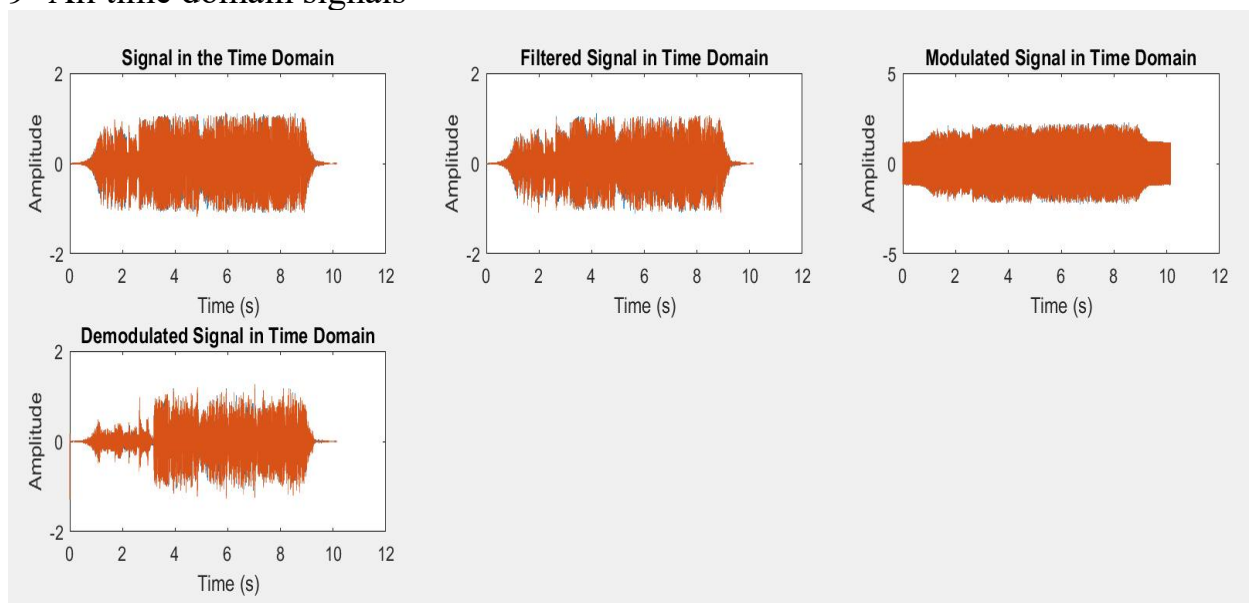


7- After using the rate detector to recover the message and playing the demodulated signal, I noticed that the sound became more muffled than the sound I heard in point number 3.

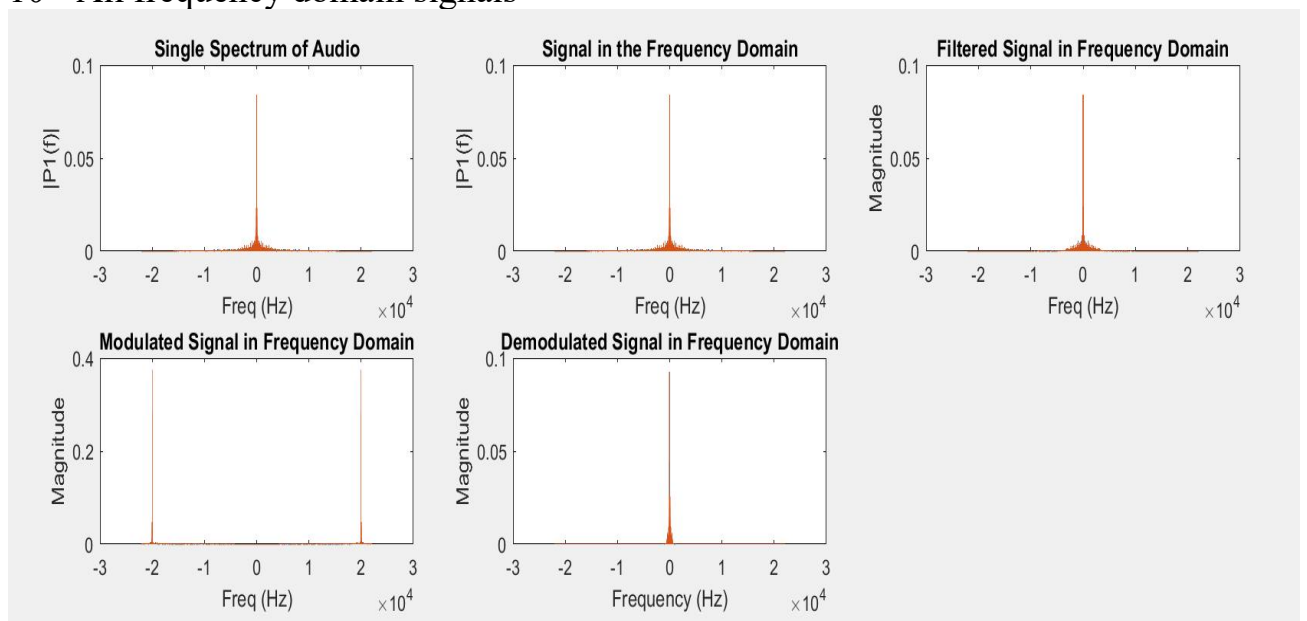
8- Demodulated signal in both domains (DSB-LC).



9- All time domain signals

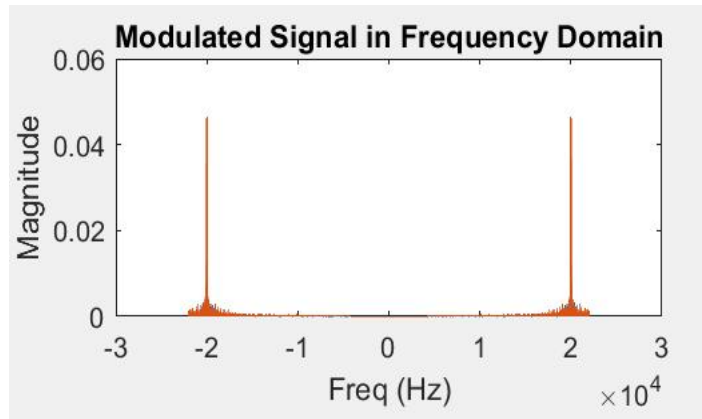
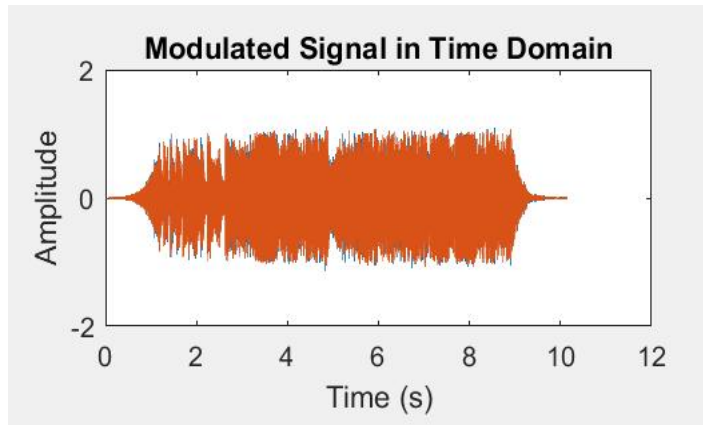


10 - All frequency domain signals



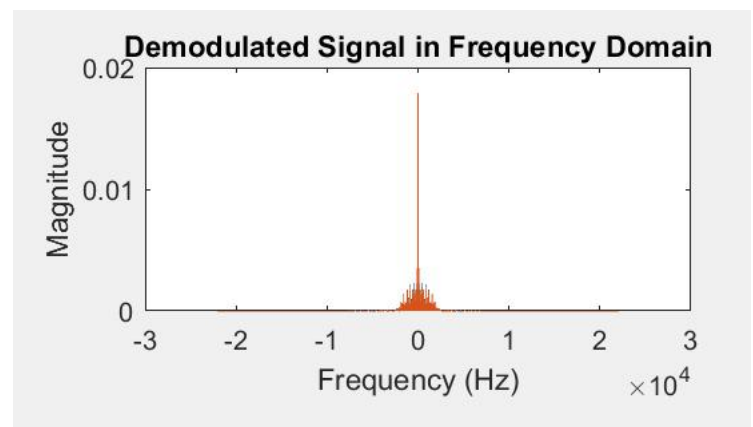
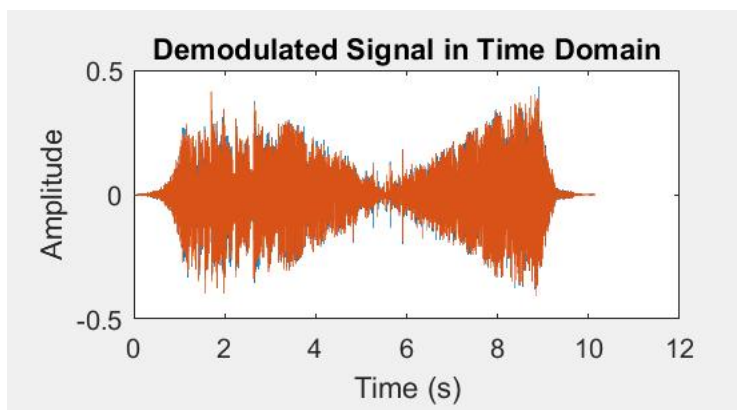
PART 2

1- Modulated signal and its spectrum (DSB-SC).



2- After using the coherent detector to recover the message. And playback the recovered signal, the sound has also become a bit muffled as when using the normal filter.

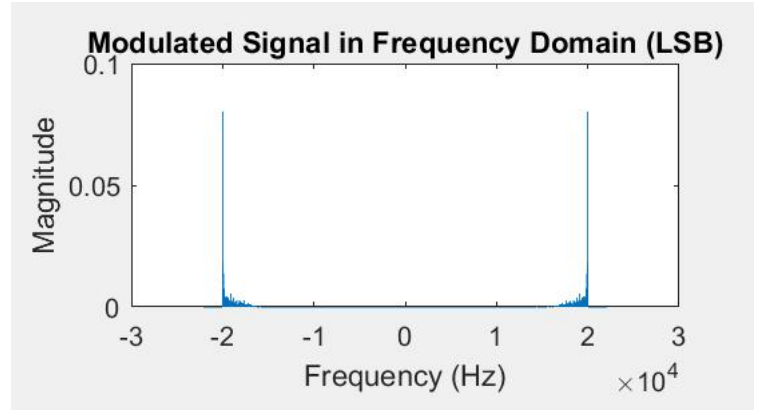
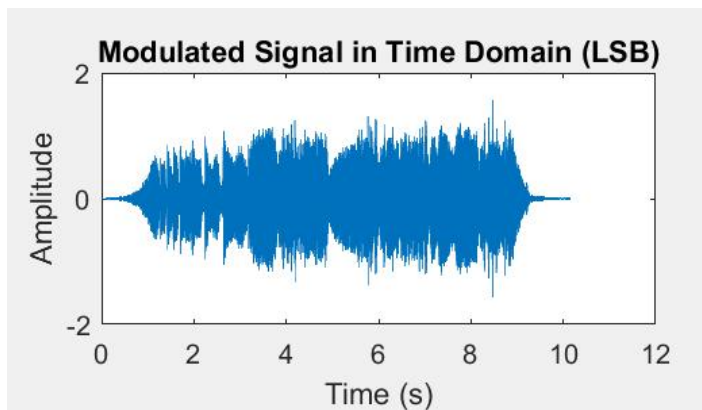
3- Demodulated signal in both domains (DSB-SC).



4- After adding several values of frequency offset, I noticed the following;

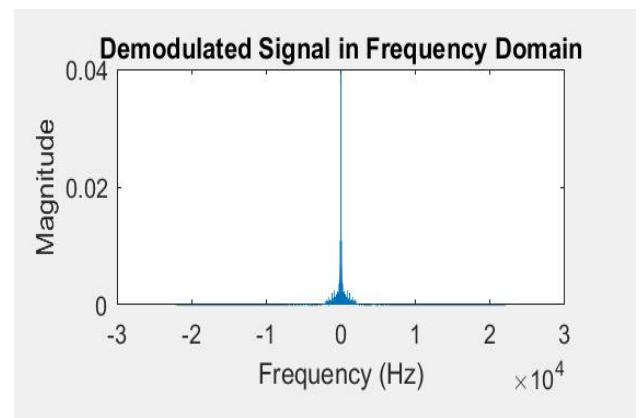
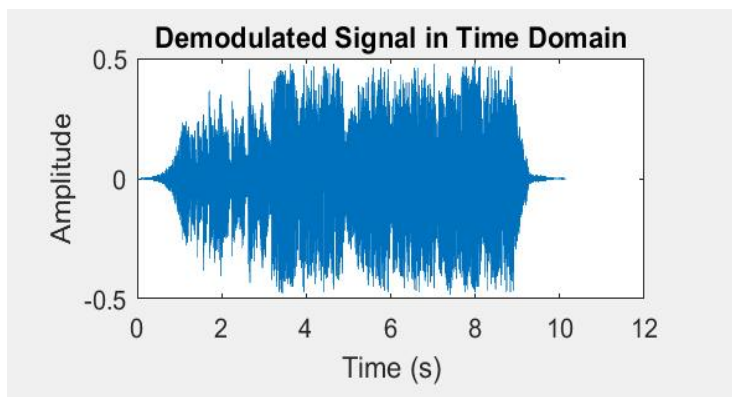
- When the frequency shift was 100Hz, the sound changed somewhat, but it almost maintained its basic structure.
- When the frequency shift was 1000Hz, the sound changed from the previous state and became noisy
- When the frequency shift was 2000Hz, the sound changed completely from what it was and became very annoying, and its intensity decreased somewhat.

5- Modulated signal in both domains (SSB-SC).



6- After demodulating the signal coherently, and playback the recovered signal. The sound condition is the same as in 2 , a little muffled and low .

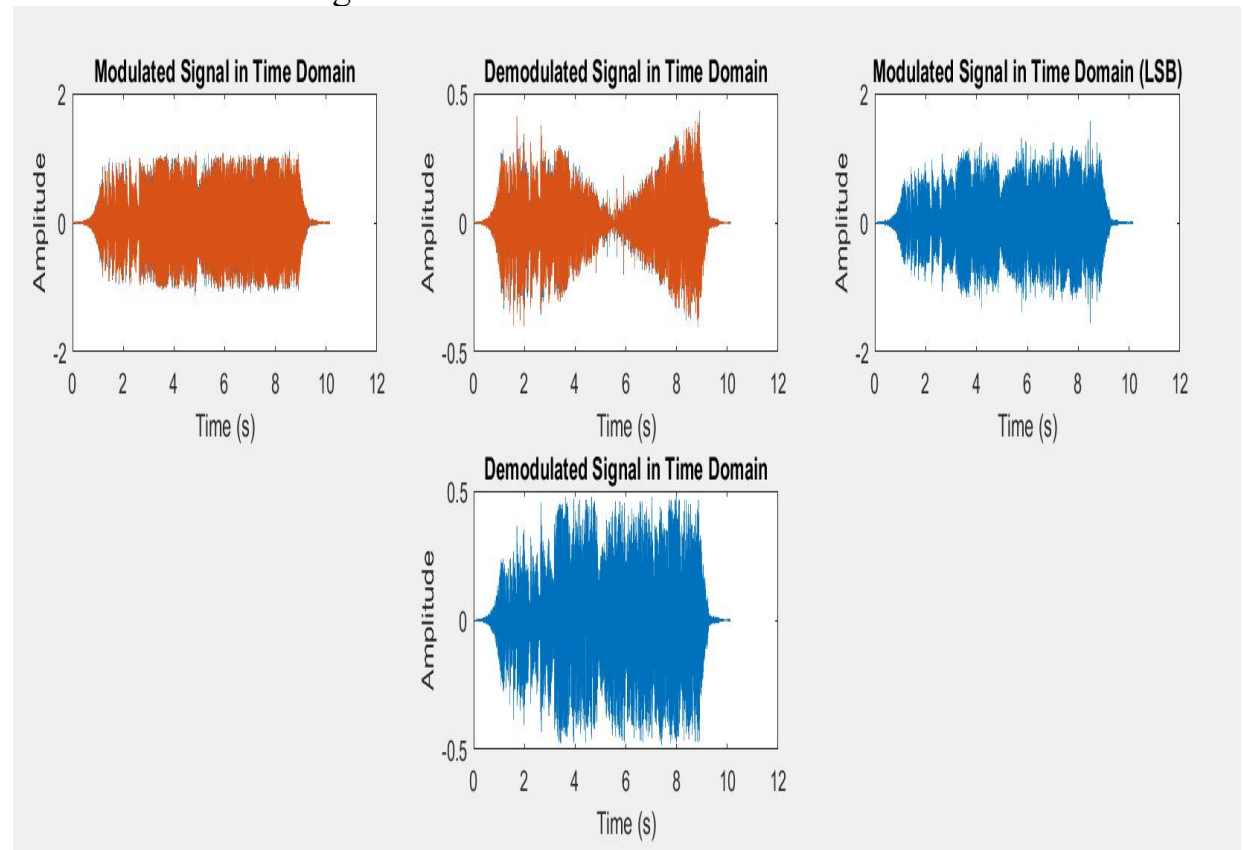
7- Demodulated signal in both domains (SSB-SC).



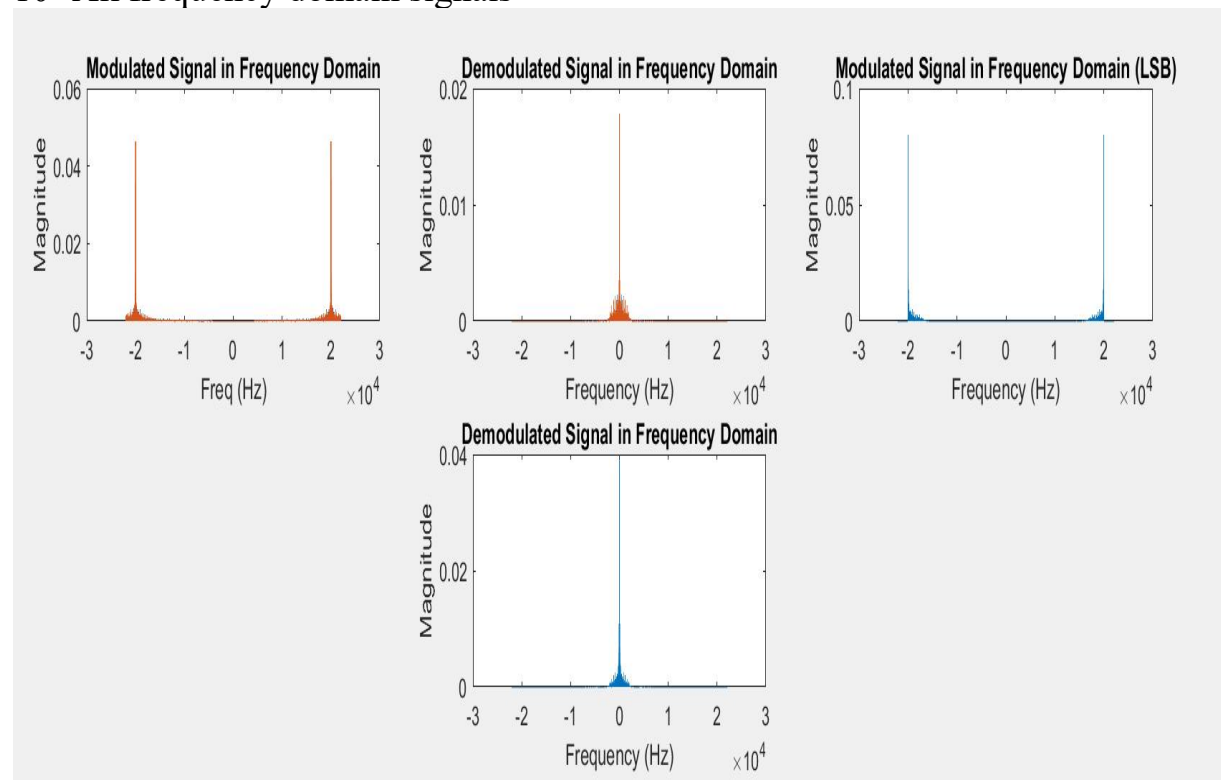
8- After adding several values of frequency offset, I noticed the following;

- When the frequency was shifted by 100Hz, the sound was slightly different from its original state, with some noise.
- When the frequency was shifted by 1000Hz, the sound changed from its original state and became sharper and more annoying than before.
- When the frequency was shifted by 2000Hz, the sound completely changed from its original state and became very low and weak.

9- All time domain signals

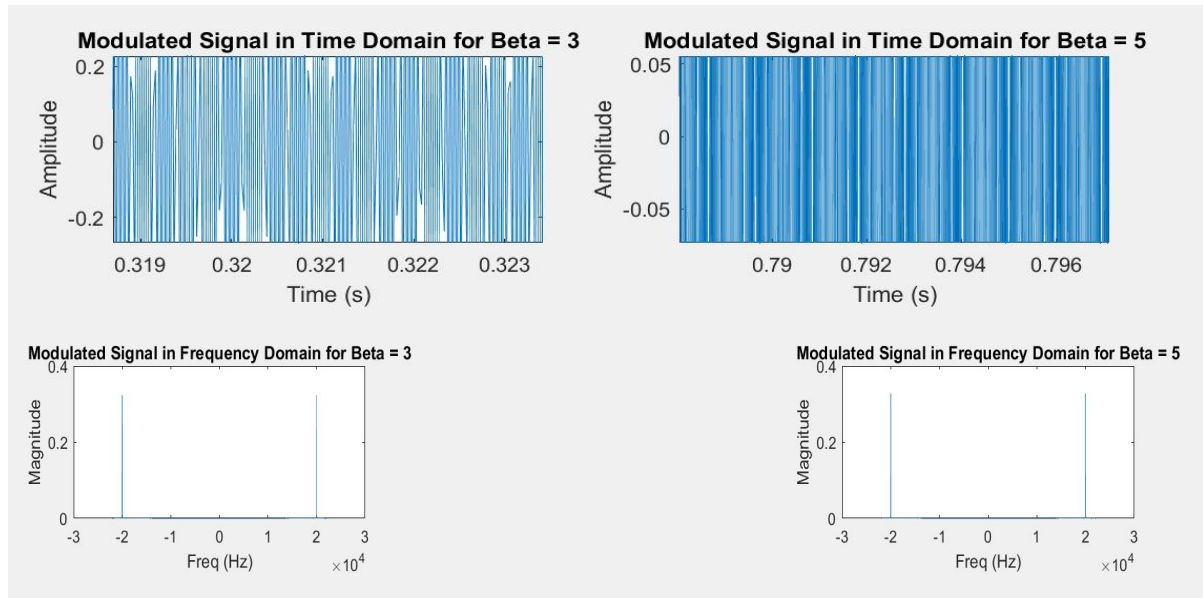


10- All frequency domain signals



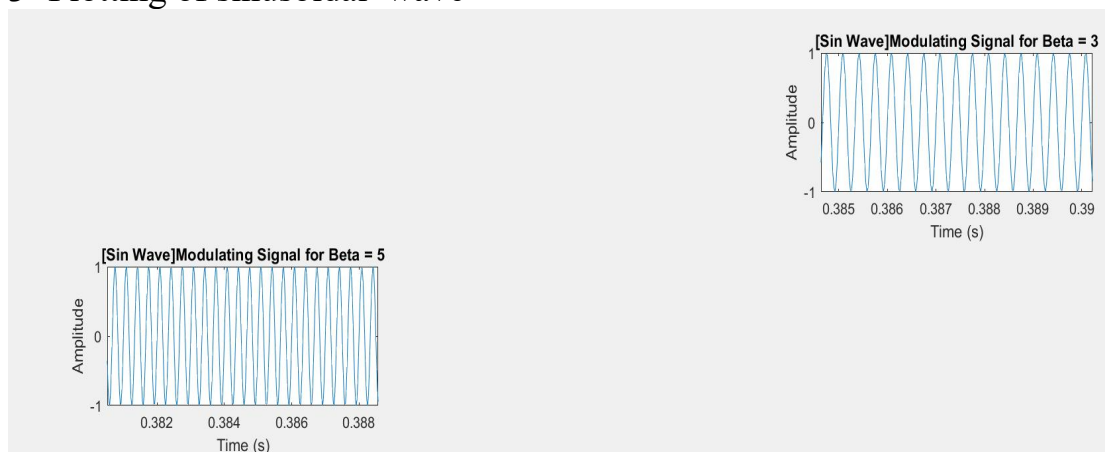
PART 3

1- Modulated signal and its spectrum for both cases (FM).

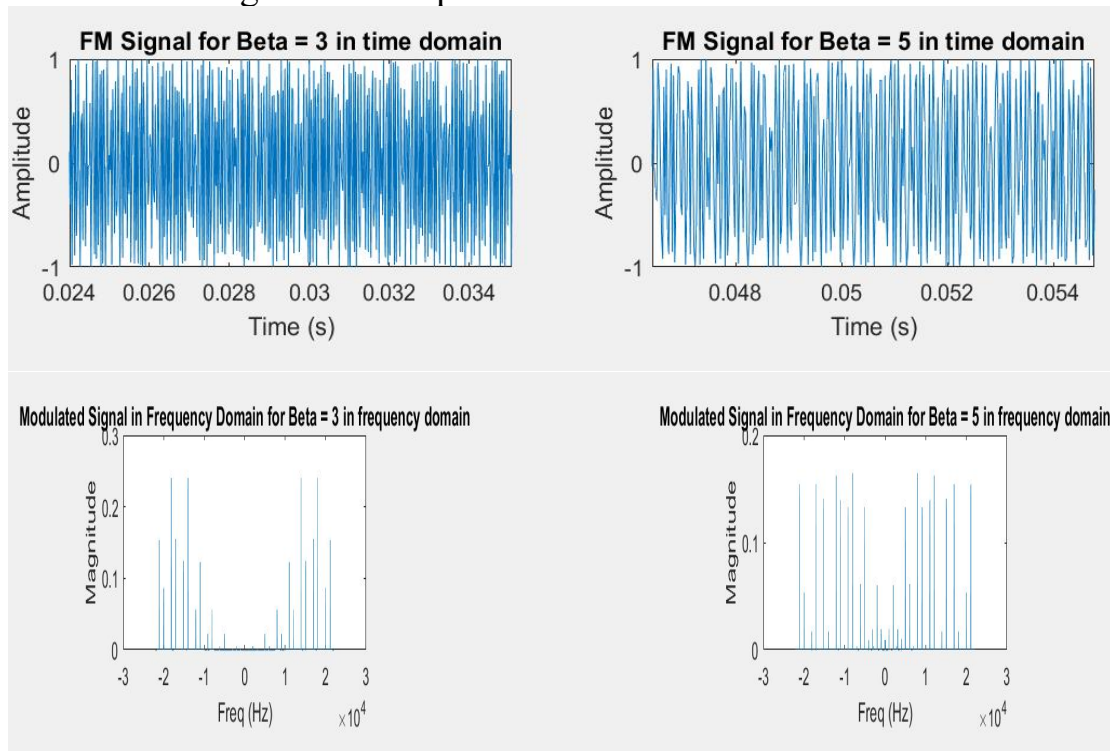


2- After using the direct method to recover the message. Playback the recovered signal, I could not hear the recorded voice at all

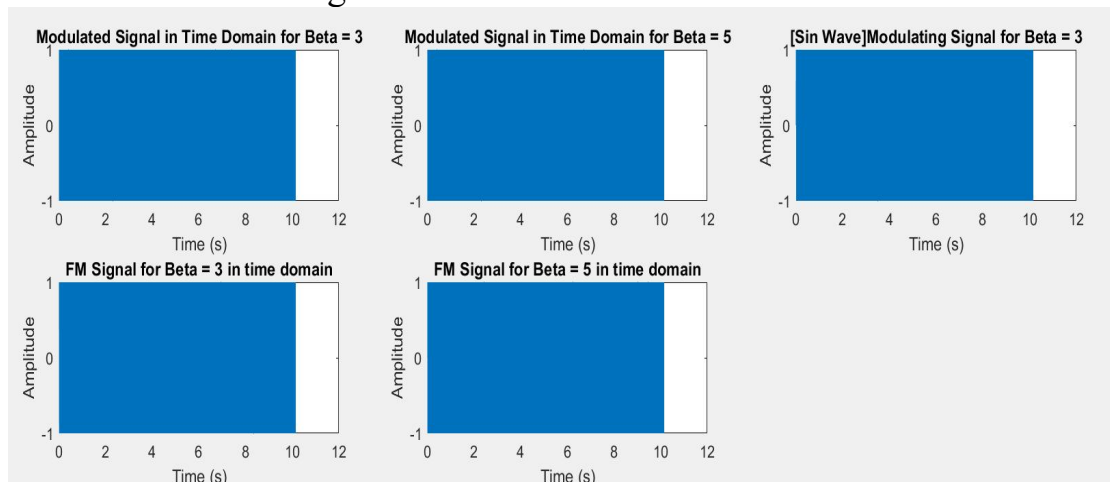
3- Plotting of sinusoidal wave



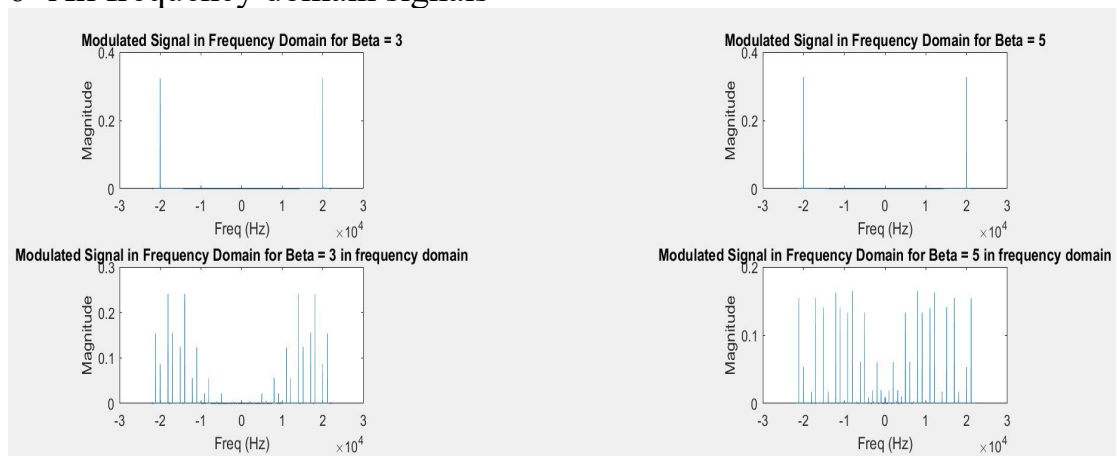
4- modulated signal and its spectrum for various values of beta



5- All time domain signals



6- All frequency domain signals



PART 4

1- Output

```
Output SNR for beta1 = 3, snr = 10: -65.26 dB
Output SNR for beta2 = 5, snr = 10: -60.83 dB
Output SNR for beta1 = 3, snr = 15: -60.01 dB
Output SNR for beta2 = 5, snr = 15: -55.56 dB
Output SNR for beta1 = 3, snr = 20: -54.91 dB
Output SNR for beta2 = 5, snr = 20: -50.47 dB
>> |
```

The higher the SNR value, the clearer the recording sound

2-

