Classwork-8

Problem 1: Amplitude Modulation

We will revisit problem 2 of classwork 5 but use our own amplitude modulation and demodulation functions. An AM double-side band suppressed-carrier (DSB-SC) signal is mathematically modeled:

$$\mathrm{AM}\ (\mathrm{t}) = \ \mathrm{m(t).c(t)}$$

where m(t) is the message to be transmitted, c(t) is the carrier wave. We use the same message and carrier as in classwork 5. In order to demodulate an AM signal, we multiply it with the same carrier wave, and then filter the result using a low-pass filter:

$$\mathrm{Demod_{AM}}\ (\mathrm{t}) = \mathrm{Low\_pass\_filter[\ AM(t).c(t)\ ]}$$

a) Explain how we can retrieve the original signal from an AM signal using the method described above.
b) Design your ‘***my_ammod***’ function. Plot the frequency spectrum of the message signal and the frequency spectrum of the modulated signal.
c) Design your ‘***my_amdemod***’ function. Plot the demodulated signal versus time and the frequency spectrum of the demodulated signal. Compare them to the plots of the message signal.

Problem 2:

An audio file *‘corrupted.wav’* contains speech data corrupted by narrowband interferers. Data is sampled at 96 kHz.

a) Estimate the frequency of the corrupting tones using FFT. Show the figure with markers (data cursors) on the corrupting tones.
b) Remove them using filters of your choice. Plot the frequency spectrum of the filtered signal using FFT. Listen to the sound and describe what they say.

Note: Remember to include the code that you use to plot signals. When design/create a filter, you have to at least include its frequency response.