ASSIGNMENT 3 - JULIA Simulation of Amplitude Modulation and Demodulation

Deadline for submission of Assignment 3: Friday 20 May 23h55.

Submit via the Assignments Tab.

Assignment 3 contains the lab simulations as a separate notebook with the additional inclusion of noise.

Note:

The notebook must be in a similar format to the other assignments

* Show simulations for the DSB-SC case (fm = 1 kHz & fc = 20 kHz)
* Show simulations for the DSB-LC case:
* Simulate demodulation using the method described in section 2.3 of the lab sheet (Half-wave rectification followed by a bandpass filter). Simulation of envelope detection is not required (although if you figured out a way then you can include it)
* Include noise (for both DSB-SC & DSB-LC cases). Model the noise as bandlimited Gaussian noise of bandwidth B = 6 kHz , centered on the carrier frequency of 20 kHz (refer back to your Assignment 2 - julia exercise 2.5.5). An example of a bandpass filter can be found in the julia_signal_processing_demo.ipynb notebook. Show simulations with no noise, and two different levels of noise.
* Calculate the noise statistics variance and standard deviation at the input and output of the demodulator. This can be done using the julia statistics library as show in the pseudo-code below:

```
using Statistics;
x = band limited noise
std(x);
var(x); # equal to the noise power
```

* Calculate and display the signal to noise ratio at the input of the demodulator and at the output. Then calculate the factor by which it changes.

Two submissions are required:

(1) PDF version for ease of marking.

filename: <student ID>_EEE3092F_Assignment3_AM_Lab_Simulations.pdf

Run the entire notebook to make sure that it runs from beginning to end and generates the plots.

Use the browser's print command (ctrl-P on Firefox or Brave) to generate a PDF file.
(Note: This is not via Jupyters notebook's own File->Download method which requires additional addons to work.)

(2) Jupyter .ipynb file (with all outputs cleared to save storage space)
filename: <student ID>_EEE3092F_Assignment3_AM_Lab_Simulations.ipynb
To clear all outputs: Cell -> All Outputs -> Clear. Then save the .ipynb file.

Submit via the Assignments Tab by due date.

I will impose a late penalty of 5% per day (unless you have a good reason to be late).