

HOMEWORK 2

Project Signals and Programming

- A. Generate a periodic signal according to the index of the letters in the English alphabet of your first name. As example, for the name "VICTOR" we will have the following values for the letter indexes:

| Letter | V | I | C | T | O | R |
|--------|----|---|---|----|----|----|
| Index | 22 | 9 | 3 | 20 | 15 | 18 |

With the index values generate a periodic signal by dividing the period in equal intervals, where the number of intervals corresponds to the number of letters in the name. Then for each interval the amplitude will be equal to the index value of the corresponding letter. For the previous example the signal on one period will be the one in Figure 1.

- Create a Matlab function that returns the periodic signal generated by your first name.
- In another Matlab script display the periodic function on at least 3 periods and determine the trigonometric, harmonic and complex Fourier series for at least 100 harmonics.
- Display the amplitude and phase spectrum for the harmonic and complex Fourier series
- Determine the total power and energetic bandwidth of the periodic signal

Note: point a. will consist of a Matlab function, points b., c. and d. can be solved in one Matlab script. All matlab script files should be in the same folder.

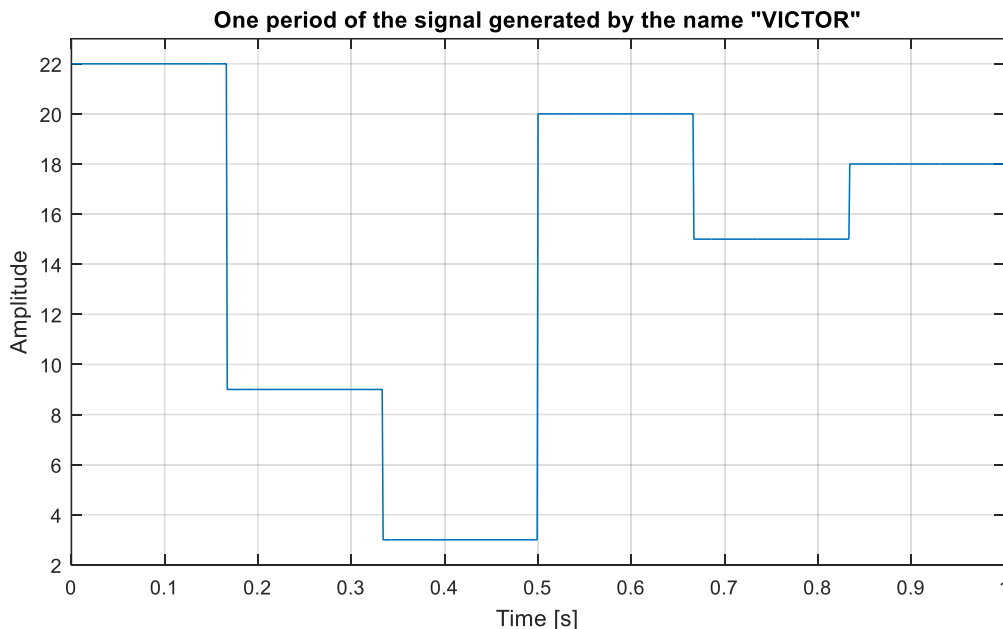


Figure 1. One period of the signal generated by the name VICTOR

- B. Display the signal $f(t)$ defined below as a function of time for at least 5 periods. Determine the trigonometric, harmonic and complex Fourier series. Display the amplitude and phase

spectrum for a number of 100 harmonics. For the harmonic and complex Fourier series, specifying the values on the axes of the graph, as well as the title of each graph.

$$f(t) = \begin{cases} \frac{2}{T}t, t \in \left[0, \frac{T}{2}\right] \\ 0, t \in \left(\frac{T}{2}, T\right) \end{cases}$$