

MSc Audio Engineering

TC70028E Mathematics of Signal Processing

Assignment: Engineering Report

The deadline for this assignment is as shown on Blackboard. This report should be word-processed and submitted through Turnitin on Blackboard.

Assignment Brief

This assignment is to be written as a technical report that you will submit as the coursework component of this module. This technical report should be properly formatted and should include contents page, introduction, results, discussions and conclusions. All figures and tables are to be numbered and provided with a respective legend. Any simulation results, tables and plots obtained from practical work should also be included. Do not include screen snapshots in your report. The report is to be written using a suitable text editor such as Microsoft Word and submission is done electronically using Turnitin on Blackboard.

Questions

- 1) Determine the members of the family of harmonically related complex exponential signals in discrete time that share a common period of $N = 7$.
- 2) Use MATLAB (or similar technical software) to plot each member.
- 3) Compare the second ($m = 2$) and fifth ($m = 5$) members of the family, and judge which one oscillates faster. Justify your answer. Explain how this can be seen from the graphs of the 2 signals.
- 4) Compare the fourth ($m = 4$) and fifth ($m = 5$) members of the family, and judge which one oscillates faster. Justify your answer. Explain how this can be seen from the graphs of the 2 signals.
- 5) Use MATLAB (or similar technical software) to write your own function to count the zero crossings of the above discrete-time harmonics. The function should be saved as a separate file (.m file in MATLAB), which you can call in order to compute the zero crossings. Present the results in a Table. Explain how these results agree or not with your conclusions in questions 3 and 4.
- 6) Use MATLAB (or similar technical software) to plot the following two signals:

$$x[n] = u[n - 4] - u[n + 5]$$

$$y[n] = u[n] x[-n]$$