ECAM ENGINEERING PROGRAMME

Academic Year: 2022/23
Examination Period: Semester 2

Name: Surname:

Year group: EENG3	
Teaching Unit Name:	Robotics & Automation course
Module Title:	Signal processing + Wireless communication
Date:	April 20th 2023
Time Duration:	1.5 Hours
Examiner(s):	Guillaume Gibert

INSTRUCTIONS TO CANDIDATES:

Write on:		■ Authorised documents:	YES ☒ NO ☐
▪ ***The answer booklet***:	YES ☐ NO ☒	**If YES, please specify: all documents**	
▪ ***The examination paper***:	YES ☐ NO ☒	■ **At the end of the examination, hand in:**	
■ Authorised calculator	YES ☒ NO ☐	▪ The examination paper:	YES ☒ NO ☐
Laptop, tablet, calculator		▪ Rough Work	YES ☐ NO ☒

Candidates can use any document, laptop, tablet and calculator.
Candidates must use Octave to analyse the provided signal.
Candidates must write a report using the provided template. The document should be converted to pdf before submission on Moodle.

Do not turn this page over until instructed to do so by the Invigilator.

Problem

As an expert in signal processing, you are asked to analyse the content of an unknown signal. Very little information is available concerning this mysterious signal. You only have access to:

- The sampling frequency $F_s = 300\ Hz$;
- A csv file containing the mysterious signal to study.

Your goals are:

1. To analyse the content of this signal i.e. extract the different components embedded in the signal using various signal processing techniques (e.g. windowing, spectral analysis).
2. The signal of interest is in the frequency range [30 40] Hz.

Instructions

Go to moodle.ecam.fr -> Signal processing + Wireless communications -> Midterm exam -> Documents

Download the csv file: **unknownsignal.csv**

Open Octave

Load the csv file using the following command: **signal = csvread('unknownsignal.csv');**

The variable **signal** is an array of double that contains the signal to analyse.

Use signal processing techniques to analyse and filter the unknown signal such as:

- windowing (standard window functions are available in Octave e.g. rectangular, hamming…)
- spectral analysis (dft, fft, spectrogram, wavelets…)
- filtering (several functions are available such as filter(), fir1(), butter()…)

Analyse the signal and write down the methods you followed and the results you obtained as a report (i.e. with an introduction and a conclusion) using the template document.

You may include figure(s) in your report.

Provide the code you used to analyse and filter the signal in the appendix of the document and as a git link as well.

Convert the document as a pdf file before submitting it on Moodle.

Documentation

Octave: https://octave.sourceforge.io/list_functions.php

Signal package: https://octave.sourceforge.io/signal/overview.html