Speech Signal Processing

Assignment 2   Course Code **EC5.408**

                                                  Max. points **20**

Note:

- Always cite your sources (be it images, papers or existing libraries). Follow proper citation guidelines

- Unless specifically permitted, collaborations are not allowed.

- Do not copy or plagiarise, if you're caught for plagiarism or copying, penalties are much higher (including an **F** grade in the course) than simply omitting that question.

- Need to mention clearly if any assumptions are being considered.

- No late submissions are accepted.

Syntax to be followed for submission

- A single zip folder has to be uploaded in the moodle, which should contain the snapshots of your Numericals, oberservations to be saved in a pdf format and computer based questions (code) should be placed in the respective folder. And the name of the zip file should strictly be **EC5_408_A2_RollNo.zip**

- For this assignment you can use either **Python** or **Matlab** which ever your are comfortable.

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1. Load the audio file (H_MKB.wav) which is provided to you into MATLAB/Python and perform the following task. *Audio file is shared along with the assignment.*
   Note: Computer Based Question

   (a) Create a time domain plot **(0.5 pts)**

   (b) Apply framing on to the signal **(0.5 pts)**

   (c) Find one voiced frame among the all the frames and plot it **(0.5 pts)**

   (d) Compute Fourier transform on the voice frame which you have considered in the step (c) **(0.5 pts)**

   (e) Apply log to the step (d) and plot it **(0.5 pts)**

   (f) Compute exponential operation for the step (e)**(0.5 pts)**

   (g) Compute Inverse Fourier transform for the step (f) and plot it **(0.5 pts)**

   (h) Comment on step (c) and step (g). If the outputs are same justify why? viceversa **(1.5 pts)**

2. Load the audio file (chunk1.wav) which is provided to you into MATLAB/Python and perform the following task. *Audio file is shared along with the assignment.*
   Note: Computer Based Question

   (a) Create a time domain plot **(0.5 pts)**

(b) In the time-domain plot, mark the regions where the pitch is the highest and the lowest. What are the pitch frequencies in those regions? **(0.5 pts)**

(c) Write a code to calculate number of zero-crossing present in the signal **(2 pts)**

(d) Compute of frame energy and comment of it **(1 pts)**

(e) Comment on what type of region it is voiced or unvoiced **(1 pts)**

3. Write a short note on the following:

- Zero-Crossing **(1 pts)**
- Autocorrelation **(1 pts)**
- Epochs **(1 pts)**
- What are the assumptions to be considered while analyzing speech signal? **(2 pts)**

4. Load the audio files lataji_nrm.wav and lataji_sng.wav into MATLAB/Python and perform the following task. *Audio file is shared along with the assignment.*
Note: Computer Based Question

(a) Create a time domain plots **(1 pts)**

(b) Plot the pitch contour **(2 pts)**

(c) Comment on the structure of pitch contour of both the signals. **(2 pts)**