Speech Signal Processing

Assignment 1 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_A1_RollNo.zip**

- For this assignment you can use either wavesufer or audacity or which ever your are comfortable (you can even use python or matlab).
- Wavesurfer can be downloaded and installed from `https://sourceforge.net/projects/wavesurfer/?source=typ_redirect` and audacity from `https://www.audacityteam.org/download/`. The installation is straight forward.

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1. What is speech? How speech signal is different from other signals ? Justify your explanation. **[2 points]**
2. Briefly Explain about the following: **[2 points]**
   - Relation between Fourier Transform and Z-Transform
   - Corticulation
   - Fundamental Frequency
   - Formant
3. "Female pitch is more when compared to Male pitch." True of False. Justify the statement with proper explanation **[4 points]**
4. Record your mother's name which should be as "I am son of < mother's name > " or "I am daughter of < mother's name > which ever category you belong to. " **[6 points]**
   - Display the waveform
   - Identify and mark the voiced, unvoiced, silence and plosive regions.
   - Acoustic-phonetic description of the regions (MOA and POA)

- Time varing system description
- Spectral details for sounds units present in the waveform

Write a brief note on your observations. For this question you are expected to submit wave file along with the annotated transcriptions. And all the acoustic-phonetic descriptions have to be addressed in the tabular format. **Note: Computer based question**

5. Record your father's name which should be as "My father's name is < name >". **[6 points]**
   - Display the waveform
   - Identify and mark the voiced, unvoiced, silence and plosive regions.
   - Acoustic-phonetic description of the regions (MOA and POA)
   - Time varing system description
   - Spectral details for sounds units present in the waveform

   Write a brief note on your observations. For this question you are expected to submit wave file along with the annotated transcriptions. And all the acoustic-phonetic descriptions have to be addressed in the tabular format. **Note: Computer based question**

Appendix

In the Acoustic-phonetic description following things are expected:

1. Consider the example of kitAb,

   kitAb (/k/,/i/,/t/,/A/,/b/)

   It is Unvoice unaspirated velar stop followed by front vowel followed by unvoiced unaspirated dental stop followed by middle vowel followed by voiced unaspirated bilabial stop.

For time varing system description following things are expected:

1. Consider the example of kitAb,

   kitAb (/k/,/i/,/t/,/A/,/b/)

   /k/ : Complete closure at velum position

   /i/ : Tounge hump is high and is in front portion of vocal track (VT) system, VT system is narrowly open

   /t/ : Complete closure at dental position

   /A/ : Tounge hump is low and is in back portion of VT system, VT system is widely open

   /b/ : Closure at lips