Cairo University- Faculty of Engineering
Computer Engineering Department
Communications Engineering – Fall 2023

Communications Project

It is required to modulate three speech signals using single sideband (SSB) modulation in a frequency-division multiplexing (FDM) system.

1) Using Matlab, record three segments of your voice of about 10 seconds each. Select an appropriate sampling frequency and explain your choice. Save the signals as 'input1.wav', 'input2.wav' and 'input3.wav'.

2) Limit the maximum frequency of the signals to a suitable value. Design a LPF filter to filter each of the signals. You should test different cutoff frequencies, listen to the filtered audio, and select an appropriate value such that the quality of audio is not significantly affected. Plot the magnitude spectrum of the modulated signals before and after filtering.

3) Perform SSB modulation in a FDM system, using suitable carrier frequencies. Justify your choice of frequencies. Modulation should be performed as studied in lectures. No built-in function should be used. Hint: Make sure that the sampling theorem is satisfied.

4) Plot the magnitude spectrum of the modulated signal.

5) Perform SSB demodulation to obtain the three signals. Plot their magnitude spectrum. Save them as 'output1.wav', 'output2.wav' and 'output3.wav'.

Deliverables:

1. An **uncompressed pdf** project report containing:
    a. Explanation of your work.
    b. All the required results and answers to questions.
    c. All the required figures. Label your figures properly.
    d. All the codes, included at the end.
2. All the code and audio files as uncompressed separate files.

Instructions:

- You can work in teams up to 2 members per team.
- Any copied results or codes will result in zero grade for both teams.
- Code in the report should be supplied as text, not as screenshots.
- It is not allowed to use any form of Artificial Intelligence in this project.

Due date: December 30, 2023, at 11:59 pm.