EE 340 Mid-semester Examination

Name:
Roll no.:

Read the following instructions carefully before starting the exam.

1. *Fill in your name and roll number at the top of this question paper. You have to return this sheet to your TA after the exam.*
2. *You have until 4 pm to complete this exam.*
3. *You are not allowed access to any notes, labsheets, or older GNU Radio files during the exam. Access to the internet, except for downloading the data files required for the exam, and for uploading your final results, is strictly prohibited.*
4. *Save important snapshots and your GNU Radio source files in a zip archive (the file name being your roll number). You have to upload the above zip file on the moodle assignment by the name 'Mid-sem'* **by 4.05 pm**. *The system will not allow an upload after this deadline; students who do not make the upload will be awarded zero marks.*

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1. **[12 marks]** Your goal in this exercise is to demodulate and recover two message signals $m_1(t)$ and $m_2(t)$ that have been SSB modulated. The message m_1 has been transmitted on the upper sideband, and m_2 on the lower sideband. You are provided with the the (real) transmitted signal, sampled at 2.5MHz at the following link:

   `https://drive.google.com/open?id=1s2CN2MIhm1BB4ntLc1fksMJ1MxxuPpsL`

   The carrier frequency is 500kHz. The bandwidth of both message signals is at most 15 kHz. Note that your demodulation methodology should be general, and not tailored to the specific message signals used here.

   (a) Recover both message signals, and show your TA the spectrum of each. You must also save a snapshot of the same in the submission archive.

   (b) Explain your demodulation methodology briefly here. Be precise; you might want to plan your response before writing it down.

   Your response:

TA comments

2. **[8 marks]** Your goal is this exercise is to demodulate a *phase modulated* signal. Recall that for a message signal $m(t)$ and carrier frequency f_c, the phase modulated signal is given by

$$A_c \cos(2\pi f_c t + m(t)).$$

The message signal here is an audio clip. The transmitted signal, sampled at 2.5MHz, is available to you here:

`https://drive.google.com/open?id=1GBcHnHybVtr4K3tgfgin7VVyYUceWsFL`

The carrier frequency is unknown but in the neighborhood of 500kHz.

(a) Recover the signal, and play it out to your TA. **Your methodology should not involve manual frequency tuning.**

(b) Explain your demodulation methodology briefly here. Be precise; you might want to plan your response before writing it down.
Your response:

TA comments