ECE/EEE F311 Communication Systems (First Semester 2023-2024)
Lab-4 (Saturday) (09-09-2023)

Objectives

In this task, the objective is to study amplitude modulated signals and its demodulation. Also, real-time visualization of the signal flow will be demonstrated.

Task 1

(a) Plot time and frequency domain of AM signal $x(t) = (A + m(t)) \cos 1000\pi t$ for three types of signals (i) $m(t) = \sin 200\pi t$. (ii) $m(t) = 200sinc(200\pi t)$ (iii) $m(t) = \sin 10\pi t + (1/3) \sin 30\pi t + (1/5) \sin 50\pi t + (1/7) \sin 70\pi t$ (iv) $\Pi(t/2)$. Take any A.

(b) Demodulate $m(t)$ from $x(t)$ using synchronous detector and envelope detector. Use function "hilbert".

Task 2

Information signals are typically characterized by their randomness when observed over time. Instead of transmitting information signals as a single entity, they are sent in smaller segments. The transmission rate is commonly quantified by measuring how many waveform symbols are transmitted in a specific time unit through the channel, often expressed as symbols per second (symbols/sec). For instance, a 3-minute audio file is not transmitted all at once but is instead sent in smaller segments of a certain duration each time. Transmission continues until the entire information is conveyed. The need to visualize signals in real-time is important.

Plot $x(t) = (2 + m(t)) \cos 20\pi t$ **where** $m(t) = \sin 4\pi t$ **real-time for** 11 **seconds by processing signals for one second. Also plot** $|X(f)|$**.**