Date:

Lab Test – Mid Term

EC303P – Principles of communication lab

Guidelines: 1) Bring your own laptop
2) Submit all the codes used and plots obtained.
3) You are free to use any MATLAB/Octave built-in functions
4) choose sampling rate to be either 0.01, if not specified
5) Use MATLAB/Octave, mention the tool used as part of your code name
6) For plots if the values are complex then plot real and imaginary parts separately
7) Use subplots wherever possible, give title and labels properly
8) If any theory questions are asked put the answer in the code in as comment

Q1. Consider the tent signal $x(t) = (1-|t|)I_{[-2,2]}(t)$, plot the following,

a. x(3t-3/2)
b. FT X(f)
c. continuous time convolution of x(t) with $v(t) = 3I_{[-1,0]}(t) + I_{[0,1]}(t) - 2I_{[2,4]}(t) + 3I_{[3,4]}$, plot v(t)

Q2. Consider a message signal m(t), whose frequency spectrum M(f) = 2tent(-1,1), plot the frequency spectrum for the DSB signal $u_{DSB} = m(t)\cos(2\pi f_c t)$, with fc = 250Hz.

Q3-A. Consider the passband signal $(\text{sinc}(2t)I_{[-1,1]}(t))\cos(2\pi f_c t)$, where $f_c > 10$ Hz .

I. Plot its power spectral density
II. Can you find the bandwidth of the baseband signal from the FT of passband? If yes, what is the bandwidth.

-B. Consider the DSB-SC modulated signal $u_p(t) = m(t)\cos(2\pi f_c t)$, with $m(t) = \sin(2\pi f_m t)I_{[-5,5]}(t)$ and $f_c > f_m$. For $f_c = 50$ Hz and $f_m = 1$ Hz, plot the LSB-SSB/USB-SSB, and find its frequency spectrum.

OR

Q4. Consider the bit stream b[n] = [100101]

a. perform binary modulation for b[n] using a reference signal of $\text{sinc}(4(t-0.5))I_{[0,1]}(t)$
b. generate the AM wave with modulation index = 0.5 with carrier frequency $f_c >> f_m$, choose f_c so that plots are clearly visible
c. demodulate the signal in b using an envelope detector circuit.
    a. Diode logic: $u(t)I_{u(t)} >= 0$
    b. Filter logic: $\exp(-t/(RC))I_{t>=0}$
    c. Average out the signal if necessary

Plot all the appropriate graphs for a, b and c.