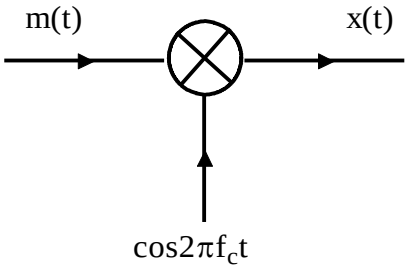
EE 411 Matlab Project-Modulation and Demodulation

Turn in:

(a) A listing of your Matlab codes,
(b) Printouts of the specified plots, and
(c) A write up of discussions.

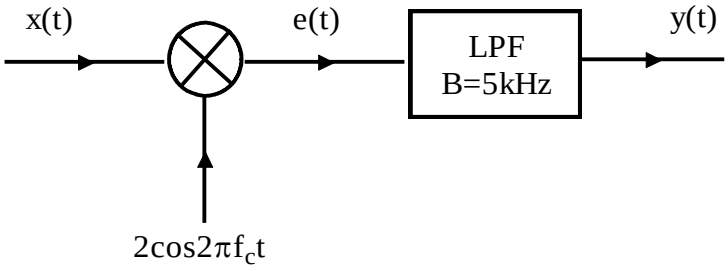
(I) Write a Matlab code, which creates a DSB modulated signal:
$x(t) = m(t)\cos 2\pi f_c t$,
The message signal is given by
$m(t) = e^{-t/a}\sin 2\pi f_1 t$,
where $a = 0.002s$, $f_1 = 500Hz$, and the carrier frequency is $f_c = 20000Hz$ (within the VLF Band , ITU Standard) .

(1) Plot the message signal m(t) for $0 \le t \le 0.008$ s at sampling rate 100000 Hz.
(2) Plot the modulated signal $x(t)$ for $0 \le t \le 0.008$ s at sampling rate 100000 Hz.



(II) Design a 20th order Butterworth analog low-pass filter with cutoff frequency 5000 Hz. Plot the magnitude responses of the filter for $0 \le f \le 8000$ Hz.

(III) Write a Matlab code, which demodulates the signal by multiplying $x(t)$ with $2\cos 2\pi f_c t$ and low-pass filtering the result $e(t)$ by the LPF designed in (II). Plot the detected signal $y(t)$ for $0 \le t \le 0.008$ s.



(IV) Make a discussion about your results. Does the code successfully perform demodulation?