Problem Set 1   Issued: 2/3/05
   Due: 2/15/05

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Reading Assignment: T. Lee, Chapters 1 & 2 (2nd ed.) or 1&18 (1st ed.).

Problem 1

The following circuit is an envelope detector for an AM receiver. Derive the relations for the resistors and capacitors to recover the original baseband waveform with the least amount of attenuation and little DC component at the output. Assume the carrier frequency $f_c \gg f_{in}$ where f_c is the carrier frequency and f_{in} is the baseband signal frequency. Also assume that the diode is an ideal (MIT) diode. Use **qualitative and intuitive** method than math. Relying on math won't get you anywhere!
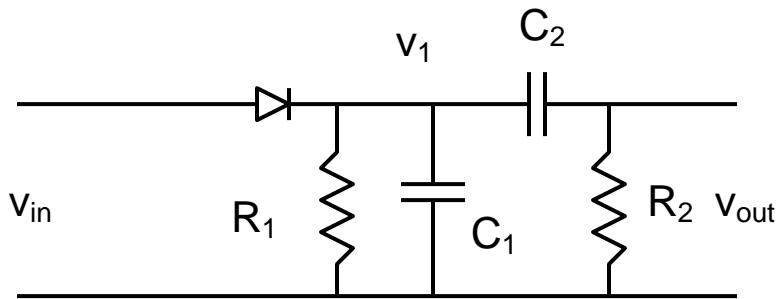
Problem 2

The following circuit is Weaver's SSB modulator. Analyze its operation by assuming $x(t)=\cos 2\pi f_m t$ where $f_m < W$. Assume that the multiplier is an ideal multiplier.
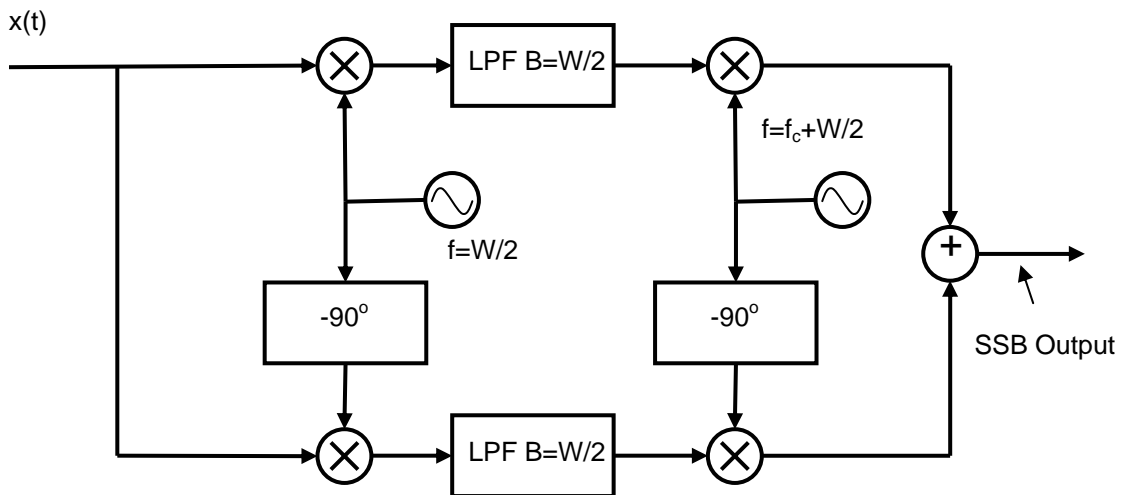
Problem 3

a) Assuming that the input to the following mixer is

$x_c(t) = A\cos 2\pi(f_{lo}+f_{in})t + B\cos 2\pi(f_{lo}-f_{in})t$,

derive the IF output. $f_{in} < f_{if.}$

b) Determine the amount of image rejection if the phase shifter for the local oscillator has 5 degree error.

c) Repeat a) for $x_c(t) = A\sin 2\pi(f_{lo}+f_{in})t + B\sin 2\pi(f_{lo}-f_{in})t$

$x_c(t)$