

ECE 3042

Spring 2013 Homework Problem Set No. 5 for Experiment No. 5

Due Week of February 18

1. The circuit shown below is known as a chopper modulator. The input, $v_i(t)$, is the message signal which will be taken to be a sine wave with a dc level of zero, a peak value of 1 V, and a frequency of 1 kHz. The signal $v_s(t)$ is a square wave known as the chopper or carrier which normally has a frequency much larger than the highest frequency in the message. For this problem the square wave will have a frequency of 10 kHz and a peak to peak value of 20 V. The output, $v_o(t)$, consists of a signal known as double side band suppressed carrier plus distortion components. Use National Instruments SPICE to simulate this circuit. Assume that the op amp is ideal. Assume that each diode is a 1N4148. The resistor values are: $R_1 = 1\text{ k}\Omega$, $R_2 = 3\text{ k}\Omega$ and $R_3 = R_4 = 500\text{ }\Omega$. Perform a transient analysis that goes from 0 – 2 ms. Plot the spectra from 0 – 12 kHz.

2. Use VEE to plot $v_o(t) = v_i(t)p(t)$ where $v_i(t)$ is a sine wave with a dc level of 0 V, a frequency of 1 kHz, and a peak value of 1 V. The pulse function $p(t)$ is a square wave with a peak to peak value of 1 V, a frequency of 10 kHz, and a dc level of 0.5 V. Display the same plots as requested for Problem 1.

3. Use Mathcad to make the plots for the function specified in Problem 2.

