TAKE-HOME HOMEWORK 1

Assigned 1/23/15; Due (in-class) 1/30/15

1. Watch all the soldering videos from the course website and in your own words describe how the soldering should be done.

2. Draw the schematic of a NorCal 40A transceiver and:
   a. compute the gains (in dB) of each of the three amplifiers in the transmitter section.
   b. compute the values of input powers in dBW for each amplifier in the transmitter section.
   c. determine the pass-band frequency range of the IF filter for $f_c=4.9\text{MHz}$. What would this pass-band be if its Q factor is halved or doubled?

3. For a 100 MHz carrier frequency, 1 MHz intermediate frequency and a 1 kHz square wave signal, sketch the spectra and waveforms at each point in the typical superheterodyne receiver. Use Fig. 1.11 in the textbook for this assignment.

4. Figure below shows a Thevenin source with a load resistor $R_l$. Find the formula for the power in the load. Find the load resistance $R_l$ that gives the maximum load power. What is the maximum load power? What should be the value of the load resistance $R_l$ be (in terms of $R_s$) such that the power dissipated on the load is 2 times larger than the power dissipated on the internal resistance $R_s$?

![Thevenin circuit diagram]
5. Figure below shows two resistive circuits that appear often in attenuators, which are circuits that reduce the power of a signal. Attenuators can prevent radios overloading and sensitive instruments from burning out. Figure (a) is called $T$ network, figure (b) is a $\pi$ network. They get their names because the outlines resemble these letters. For each circuit, find the parameters needed to make Thevenin and Norton equivalent circuits: $V_0$, $I_s$, and $R_s$. Make sure that you express each quantity in the simplest form.