IN3170 LAB 1

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Task 1.

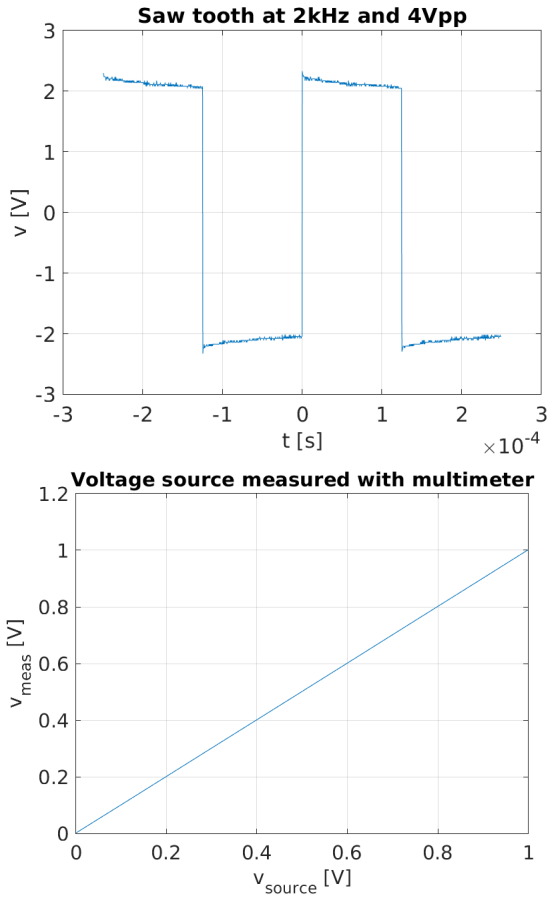

Figure 1: The demo plots to show that the MATLAB code works as intended

After following the steps laid out in the task, shorting the Waveform generator output to a scope probe connecting to channel 1 and shorting the 6V output of the current source to the multimeter and running the example code we can clearly see the square wave at 2kHz and 4 Vpp, and ramping voltage source from 0 to 1 V.

Task 2.

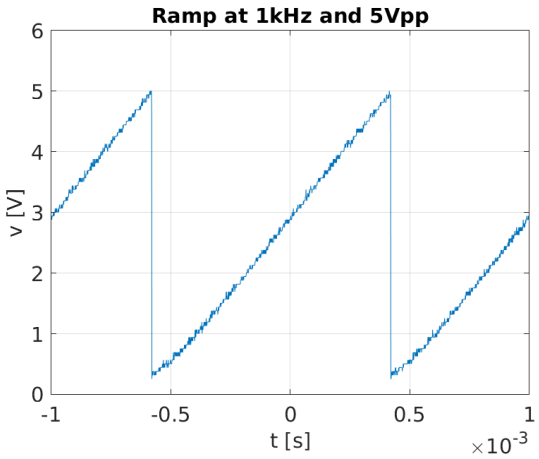

Figure 2: Sawtooth signal from the edited MATLAB code.

We edited the input voltage to be a sawtooth with a frequency of 1kHz and 5 Vpp, and the power supply to be a constant 5V.

Task 3.

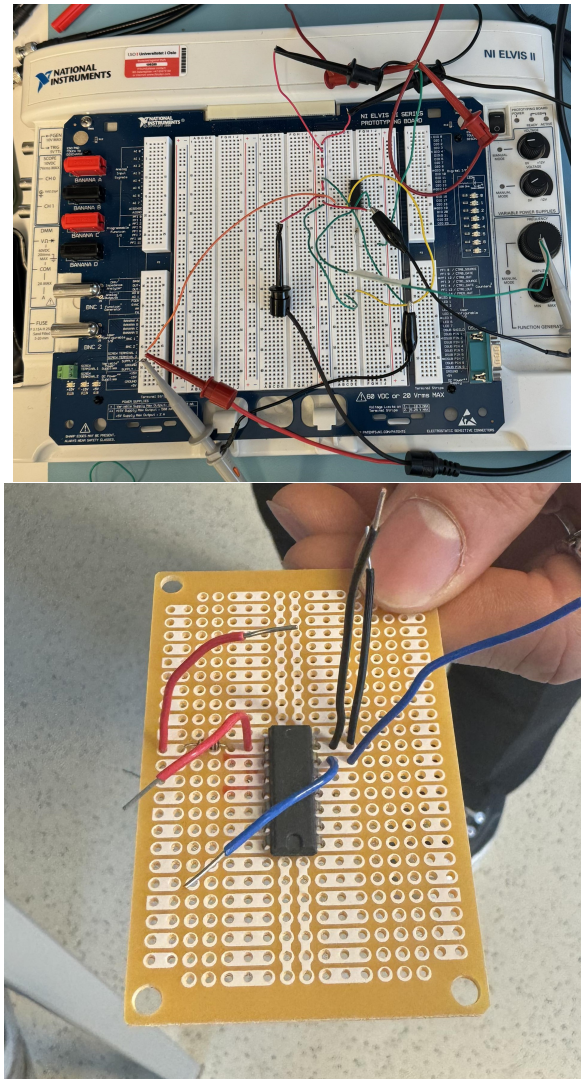

Figure 3: Breadboard and soldered PCB.

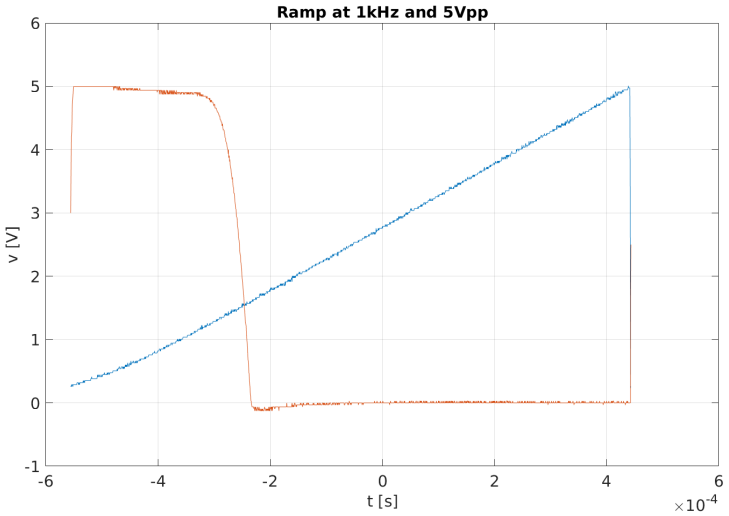

Figure 4: The input ramp voltage in blue and the output voltage in orange.

With the same MATLAB code as task 3 we soldered the circuit after the instructions. We connected the waveform generator output to the nFET gate input and the scope's channel 2 to the CS amplifier output. We left channel 1 connected to the waveform generator/CS input too, so that we could observe both input and output at the same time.

Task 4.

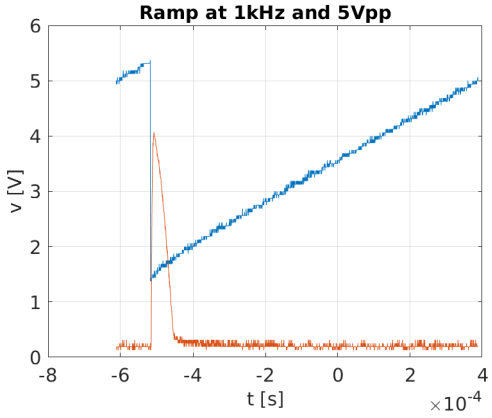

Figure 5: Same plot as Task 3, but with an input offset and adjusted ramp.

After soldering the PCB we changed the offset voltage on the input so that the transistor would be in saturation throughout the whole ramp, avoiding the triode region. To accommodate the offset we reduced the ramp peak as well, but the operating region would still be at 2.5V. To find the output gain you have to look at the output voltage slope in the operating region vs the input slope. A suitable offset voltage of 1.2V gave a gain of -15.04 which makes sense as the circuit we're building is a common source amplifier (correlates with the plot as well.).

Task 5.

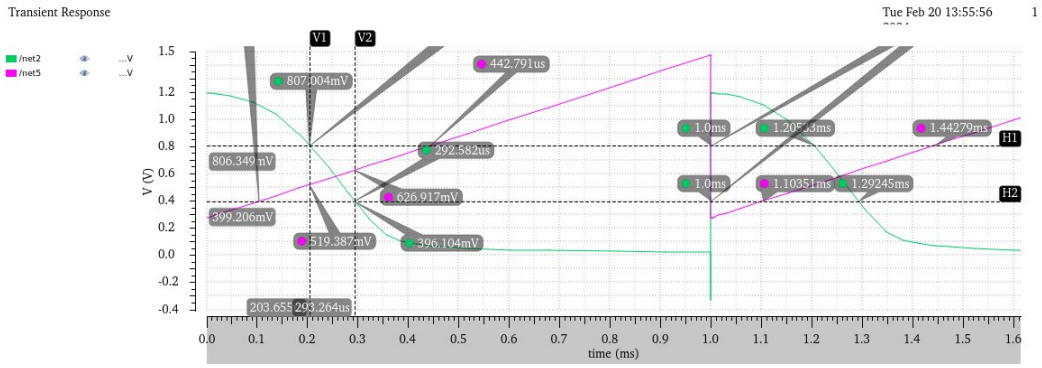

Figure 6: Maestro plot of the cadence circuit with a 'tsmcN65' transistor.

In cadence we built an identical circuit as in the tasks above, but with a different transistor technology. Using the same methodology as in Task 4. We calculated the output vs input slope and found a gain off -4.0. As the task didn't specify, we didn't apply an offset voltage so the triode region is depicted in the plot (the flat region before the slope on the output plot).