# Lab exam 2. Sequential Circuits

## Important information

Download the files `LabExam2_eng.pdf` and `Information_eng.pdf` from Moodle.

After finishing the design in Logisim, the student must upload to Moodle the file `labgroup_surname_name.circ` including the designs corresponding to the circuits of Parts 1 and 2. For example, `A1_martinez_pedro.circ`.

Don't use switches for constant signals, instead use Logisim constants Ground and 1 (in *Wiring*).

The scoring of this lab exam is 1,3 points

## Part 1 (0,9 points). Implementation of circuit *main* using subcircuits *Cont_mod_7* and *Circ_deco*.

Implement in the *main* panel the circuit that generates the cyclic sequence of the numbers contained in the student's DNI. If the first digit of the DNI is 0, start the sequence from the second digit. For example, if the DNI is 04595410-N, the sequence must be: 4, 5, 9, 5, 4, 1, 0, 4, 5, 9,….

The student must design two subcircuits (*Cont_mod_7* and *Circ_deco*) and integrate them into the *main*.

- The subcircuit *Cont_mod_7* is a mod-7 counter, in which the student must use the FFs assigned in the file `Information_eng.pdf`. In this subcircuit take **switches** for both, the clock and start (or reset) signals, using the labels "*clock*" and *"start"*. (0.6 points).

-The subcircuit *Circ_deco*, decodes the output of the *Cont_mod_7*, thus providing the corresponding DNI's digit. The implementation of this subcircuit is free. (0.2 points)

Finally, integrate *Cont_mod_7* and *Circ_deco* in the *main*. In the *main* panel use a clock signal of 1 Hz (frequency in Logisim), a button to initialize the whole circuit and a display (*Hex Digit Displays*) in order to visualize the digit of the DNI sequence. (0.1 point). Remember that the circuit must be initialized to the first number of the DNI sequence.

## Part 2 (0,4 point). Adding subcircuit *Letter*

Design first the subcircuit *Letter* which visualises letter A if a digit is 1, 2, 3 or 4 , letter E if the digit is 5,6,7,8 or 9 and letter F if the digit is 0. The implementation of this subcircuit is free. Include a display (*Hex Digit Displays*) to visualise the letter.

Finally, integrate the subcircuit *Letter* into the *main* and include a display (*Hex Digit Displays*) to visualise the corresponding letter.