Lab exam
Combinational Circuits

The scoring of this lab exam is 1,2 points

Important information

Download `LabExam1_eng.circ` from Moodle and rename it as `A_surname_name.circ`. For example, `A_martinez_pedro.circ`. After finishing the lab exam, the student must submit to Moodle the file `A_surname_name.circ` including the responses of the exam.

Don't use switches for constant signals, instead use Logisim constants 0 and 1 (in *Wiring*).

Use binary inputs. Don't use bit-vectors as inputs.

Remember that all circuits must be ready for simulation, otherwise the score of the circuit will be zero points.

Lab exercise

Particular functions *F(A,B,C)* and *G(A,B,C,D)* have been assigned to each student according the ID number in the file `Funciones_F_G.pdf`. In the first column of `Funciones_F_G.pdf` the student can identify the row corresponding to his/her ID. The rest of the columns on the right contain, respectively, the positions of the truth table in which F takes value 1 and in which G takes value 1. This search can be easily done by typing < Ctrl + f >.

Part 1 (40%). Function F

Open your `A_surname_name.circ`. First of all, type in the upper part of the *main* panel the following data (select the icon ![A], go to the equal sign (=), click aside and type the requested information, as can be seen in the figure below).

- The assigned positions in which function F takes value 1 (according to your ID).
- ID number:

Then, answer the following questions by typing aside the respective equal signs:

- Simplified expression of F as SOP. Use the tilde as an inverter. (5%)
- Simplified expression of F as POS. Use the tilde as an inverter. (5%)

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COMPUTER TECHNOLOGY EXAM 1
Fill the following data;
        Part 1. Assigned positions for F =
    ID (or DNI) =
Find:
    SOP,    F(A,B,C)=
    POS     F(A,B,C)=
```

Finally, design the following subcircuits (we have already defined them for you, so enter into the subcircuit and put your solution):

- (*subcircuit 1.1.*). Circuit of F using NOR gates in two levels. You can use some inverters if necessary. (15%)
- (*subcircuit 1.2.*). Design an **active-low output DEC 3x8** with **active-high enable**, using modules DEC 2x4 of the Logisim library. (15%). Important remark: put the property *Disabled Output* of the decoders DEC 2x4 to Zero.

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Part 2 (40%). Function G

First of all, type the assigned positions in which function G takes value 1 (according to your ID).

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· Fill the following data;  · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · ·
· · · · · · · · · · · · · · · · Part 2. Assigned positions for G =  · · · · · · · · · · · · · · · ·
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Design the following subcircuits (we have already defined them for you, so enter into the subcircuit and put your solution):

a) (*subcircuit 2.1*). Digital circuit of G using the module DEC3x8 of *subcircuit 1.2*. You can use one o more modules and the necessary gates.(20%)

b) (*subcircuit 2.2*). Digital circuit of G using only one MUX8x1 and the necessary inverters. Take the selection inputs freely.(20%)

Part 3 (20%). Main:

a) (*main*) Design the *main* circuit that integrate the aforementioned subcircuits 1.1, 2.1 and 2.2 with common inputs A, B, C for F and A, B, C, D for G. (20%)