Industrial Processes Automation

MSc in Electrical and Computer Engineering
Scientific Area of Systems, Decision, and Control

Winter Semester 2012/2013

1st Training Laboratory Work [1]

"Majority" Circuit

In this work a "majority" circuit is implemented in the Programmable Logic Controllers (PLCs) available at the laboratory. The following stages should be pursued:

i) Introduction to the PLC Schneider (Premium P57) available in the laboratory, namely in its constituting subsystems: a) PLC initial configuration, b) User manuals from Schneider, c) Software development system, d) Software *download* , e) How to edit and debug solutions, f) *Interface* with external devices.

ii) Basic automation synthesis and analysis.

The "majority" circuit is composed by an even number of inputs (to be detailed) and one output. The purpose of this circuit is to output the logical value '1' whenever the number of inputs with value '1' is greater than the ones with value '0'. Otherwise its output must be '0'. The case where there are equal numbers of '0' and '1' (tie) in the inputs is not possible in this circuit.

1. Discuss the Boolean function associated to the "majority" circuit with 3 inputs.

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[1] *This training problem has no direct contribution to the final grade.*

2. Identify the inputs and outputs that will be used on the PLC:

Inputs	Identifier
input1	
input2	
input3	
Outputs	
outp123	

3. Program in the Ladder language a program that implements the proposed solution.

4. Download and execute the program to the PLC. Comment on the results.

5. Search in the user manuals how to: i) denote the inputs as 'input1', 'input2', and 'input3' and the output as 'outp123'; ii) force the inputs to different values, for debug purposes; iii) try to modify the program, while it is under execution.

6. Suppose that a "majority" circuit with 9 inputs must be designed. Discuss if you can use three (first stage) plus one (second stage) of the circuits previously proposed to solve this new problem. Suggest an alternative solution.