Laboratory report

|  |  |
| --- | --- |
| Subject of the exercise: | Application Techniques of Logic Controllers (Exercise 11.) |
| **Date:** | <year>. <month>. <day> |
| **Students name:** | <name 1> |
| **Course and group No.** | Course: <Course No>, <Group No.> |
| **Supervisors:** | <name 1>, <name 2> |
| **Task code:** | PLCxx |

Measurement Tasks

1. Answer the questions for your assigned preparatory task 1.

A:

B:

1. Answer the questions for your assigned preparatory task 2.

Briefly explain the principles used in the solution!

* 1. A: Enter the old and new values of working point (with dimensions)

<results>

* 1. B: Specify the transfer function of your first order process. Figure time constant and gain of the process (with dimensions) using method written in Application Techniques of Logic Controllers. Control your figures.

<results>

* 1. C: Check the behavior of the process with the MATLAB step statement. Simulate the behavior of the obtained continuous process even with the input signal specified in the file (e.g: lsim statement)! Plot in the same figure and then compare the measured and simulated output signal! (Use the inverse Laplace transform of the step response function in Excel!) If signals are not in the same figure this part is invalid.

<results>

* 1. D: Determine the mean and standard deviation of the measured and simulated signal deviations. Make sure that the definitions are implemented correctly.

<results>

1. Identification of system components
   1. Learn how to use the PLC based on the downloadable video look at the   
      <https://web.microsoftstream.com/video/c1ccc11c-6508-4495-b3c7-aaf037fec173>

video and answer the following questions!   
  
Verify the measurement configuration:   
- identify the hardware components,   
- the connections of the thermal process   
- and the software components of the man-machine interface.

The hardware components of the system:

The components of the man-machine interface:

* 1. What is the signal level of the analog outputs and inputs of the PLC and what function do they perform in the measuring arrangement?

<results>

* 1. How do we measure the temperature of the heat sink? How can we increase or decrease the temperature of the heat sink?

< results >

1. Identification of the thermal process
   1. Identify the first order thermal process according to your task code in your .csv file (containing time, heating voltage, output temperature values). Use the measurement data to determine the parameters of the thermal system. (e.g. MATLAB, Excel).

< results, Matlab figures >

* 1. Calculate the transfer function of the system in time constant as well as zero-pole form. In a common diagram, compare the behaviour of the measured and calculated system in the case of step response.

< results, Matlab figures, conclusions >

* 1. Knowing the transfer function, determine if the measurement data contains enough sampling points to accurately determine the transfer function of the process? At least how many sampling points need to be measured in order to determine the transfer function to within 1% accuracy?

1. Getting to know and study the identified system
   1. How much one-time manual intervention signal must be set at the system input (U) to set a temperature value (T) that we specify? (The intervention signal is NOT periodically!!)

< calculation is a must >

* 1. Calculate the time it takes for the process to reach steady state with an error of 1 °C.

< calculation is a must >