**TEL 203/03 Process Control and Instrumentation**

**Course Assessment 1 (CA1 – 30%)**

**Evidence of plagiarism or collusion will be taken seriously, and the University regulations will be applied fully. You are advised to be familiar with the University’s definitions of plagiarism and collusion.**

Instructions:

1. This is an individual assignment. No duplication of work will be tolerated. Any plagiarism or collusion may result in disciplinary action, in addition to the **ZERO** mark being awarded to all involved.

2. You are to submit online of your answers in OAS system and it is your responsibility to submit your CA correctly and timely. OAS system does not allow re-submission of the assignment. Marks will be awarded for correct working steps and answers.

3. The total marks for CA1 are 100 and contribute 30% towards the total grade.

4. CA1 must be done individually.

5. Your assignment must be word-processed (single spacing) and clearly laid out. Any additional appendices or attachments must be placed at the end of the submitted document and must be referred to in the main body of the assignment, or it will not be read by the marker.

6. All files or documents submitted must be labeled with your WOU ID and name.

7. Please be advised to use following naming convention to your assignment:

**<class code>\_<student ID>\_ASSIGNMENT1**



**PLAGIARISM DECLARATION FORM (T-DF)**

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| **Instructions**  **Please complete and attach this Plagiarism Declaration Form to each Assignment that you submit into the Online Assignment Submission (OAS) system for marking.** |
| I declare that the attached work is entirely my own (or when submitted to meet the requirements of an approved group assignment is the work of the group), except where materials cited, quoted or paraphrased are acknowledged in the text. I also declare that this work / assignment has not been submitted for assessment in any other course or university without due acknowledgement.  I understand that plagiarism, collusion, and copying are grave and serious offences.  I understand that disciplinary action (which may include deduction of marks in the Assignment) will be taken against me if I am found to be an offender of Assignment plagiarism.  **Full name and IC No: Date:** |

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| --- | --- |
| **Assignment (Asgmt) Declaration Form** | |
| Semester/Year |  |
| Student’s Name |  |
| Student’s ID No: |  |
| Course Code |  |
| Course Title |  |
| Class Code |  |
| Assignment No: |  |
| No. of pages of this Assignment *(including this page)* |  |
| Tutor |  |
| Course Coordinator | DR Mohd Hezri Bin Marzaki |

***T-DF*** *Assignment Declaration Form (1/2020 version #003)*

**Question 1**

1. Briefly explain THREE (3) differences between open loop system and closed loop system. You need draw diagrams to illustrate your answers.

[5 Marks]

1. Explain all elements in the typical process control closed loop system

[4 Marks]

1. The temperature of steam distillation plant is controlled by On-Off controller. The heater is located at the bottom of the distillation tank with RTD is used to monitor the temperature of the plant.
2. Draw a block diagram indicating all the components and variables in the system.

[4 Marks]

1. Briefly explain the operation of ON-OFF controller in this application.

[4 Marks]

1. List TWO (2) advantages and TWO (2) disadvantages of ON-OFF controller.

[4 Marks]

1. Suggest TWO (2) improvement could be made to the system to prolong the life of the heater.

[4 Marks]

**Question 2**

1. A linear liquid-level control system has input control signal of 0 to 10 V is converts into displacement of 1 to 5 m.
2. Determine the relation between displacement level and voltage.

[5 Marks]

1. Find the displacement of the system if the input control signal 50% from its full-scale

[3 Marks]

1. A PT100 RTD temperature sensor has a span of 25°C to 250°C. A measurement results in a value of 200°C for the temperature. Specify the error if the accuracy is:
2. ±0.5% full-scale (FS)

[4 Marks]

1. ± 0.1% of span

[4 Marks]

1. ±1.5% of reading

[4 Marks]

1. A controller output is a 4 to 20 mA signal that drives a valve to control flow. The relation between current, *I* and flow, *Q*:

*Q* = 25 [*I* – 3 mA] ½ liter/min.

1. What is the flow for 15 mA?

[2.5 Marks]

1. What current produces a flow of 2 liter/min?

[2.5 Marks]

**Question 3**

1. List 3 basic elements needed in a programmable logic controller (PLC) and briefly descript each one of them.

[9 Marks]

1. Draw a diagram to show the basic structure of a programmable logic controller (PLC). Label your diagram correctly.

[4 Marks]

1. List two operations mode of a programmable logic controller and briefly explain each of them.

[6 Marks]

1. In the context of process control, the controller operating on a discontinuous mode initiates a discontinuous change in the controlled variable. Name two basic operations in the discontinuous mode and explain each of them

[6 Marks]

**Question 4**

Design a ladder diagram to implement the control function based on the following truth table:

|  |  |  |
| --- | --- | --- |
| Switch A | Switch B | Light |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

[5 marks]

|  |  |  |
| --- | --- | --- |
| Switch A | Switch B | Light |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

[5 marks]

|  |  |
| --- | --- |
| Switch A | Light |
| 0 | 1 |
| 1 | 0 |

[5 marks]

|  |  |  |
| --- | --- | --- |
| Switch A | Switch B | Light |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

[5 marks]

|  |  |  |
| --- | --- | --- |
| Switch A | Switch B | Light |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

[5 marks]

**End of Course Assessment 1**