Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

ONLINE EXAMINATIONS, JANUARY- FEBRUARY 2021

INDUSTRIAL AUTOMATION AND CONTROL [ELE 4015]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 27 January 2021** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Illustrate an automated system that uses the major areas of industrial technology with a detailed case study. ***(03)***

1B. A thermal process control system for a boiler management system has a dual position controller. When the heating system is turned off the temperature drops @ 2 K /min and when the system is ON the temperature rises @ 4 K /min. The set value of the process is 323K and the neutral zone is 4 % of the set value. There is a half minute time lag @ both the on and off switch points. Compute the period of oscillation. ***(04)***

1C. List any two significant characteristics of proportional, integral and derivative modes. ***(03)***

2A. Elaborate with a neat diagram the process of converting an electrical signal to a pneumatic signal used for driving a control valve which operates as per ISO standards. ***(03)***

2B. Explain ratio control with a block diagram. Design a ratio control to control the mixture of solvents inside a chemical tank reactor operating under controlled temperature. ***(04)***

2C. Design a ladder diagram for implementing a 4:1 multiplexer and 1:4 demultiplexer ***(03)***

3A. Design a ladder diagram for a decorative system with an LED flashing ON and OFF for 4 and 6 secs respectively. If the start button is triggered more than five times there should be a circuit breaker to interrupt the process for next 3 mins. [Note: use a timer without reset] ***(03)***

3B. In a printing press industry, a hydraulic machine has three inputs which need to activate within a time interval of 5 secs to start the process. If the process is stopped using a stop switch there is a cooling fan which runs for 4 mins more to dissipate heat generated in the process. Design an appropriate ladder diagram to implement the process. ***(03)***
[Note: use latching technique to activate the process]

3C. With the help of a block diagram and timing diagram explain the working of TOFF timer and up-down counter. ***(04)***

4A. A sheet metal manufacturing industry has a conveyer belt running across the production unit. The length of the sheet metal placed on the conveyor belt is monitored using proximity sensor with a tolerance of ± 1 cm each side. If there is a difference in length the process needs to be interrupted with a delay of 2 mins until the sheet is rejected. If the number of rejections is more than 30, the process needs to be restarted with a delay of 20 mins. Design a suitable ladder diagram to implement the process [Note: the set point for sheet length is 49 cm] ***(04)***

4B. Explain the difference between SKIP and MCR functions with the help of ladder diagram. ***(02)***

4C. With neat diagram explain the different redundant schemes in SCADA with an example for each. ***(04)***

5A. Explain in detail the difference between Centralized control and distributed control. Also, explain the improvements made in the conventional DCS system with the help of fieldbus. ***(04)***

5B. Explain Multi-drop technique employed in HART protocol. List out its limitations ***(02)***

5C. Explain the various states initiated during a multi-task program execution with the help of a finite state machine diagram. Also explain the different types of interrupts employed by real time embedded systems. ***(04)***