Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER EXAMINATIONS, DEC 2016/JAN 2017

SUBJECT: LOGIC AND DISTRIBUTED CONTROL SYSTEMS [ICE 413]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A.	Develop the flowchart which shows typical operations required to take a data sample from an ADC.	**4**
1B.	With neat timing diagram, explain the retentive OFF delay timer.	**4**
1C.	Draw the typical PLC input and output symbols for following devices. (i) Mushroom Head. (ii) Liquid Level Switch (iii) Bell. (iv) Flow Switch.	**2**
2A.	Explain the typical PLC –CPU power supply in block diagram form.	**4**
2B.	In dangerous processes it is common to use two palm buttons that require an operator to use both hands to start a process. To develop this there are two inputs that must be turned on within 0.25 sec of each other before a machine cycle may begin. Write ladder logic for this dangerous process machine. Write ladder logic for the above.	**3**
2C.	Describe the different types of latching techniques are used in PLCs.	**3**
3A.	Draw the scan cycle of a PLC and how the self-diagnosis is performed in PLC.	**2**
3B.	Describe the operation of the eight lines SKIP function in PLC system. (SKIP0046 003).	**4**
3C.	Illustrate the need of PLCs in process control industries with a suitable example.	**4**
4A.	Describe the Burst mode in HART Communication Protocol.	**4**
4B.	Write a ladder logic program for the following i. When button A is pushed, a light will flash for 5 seconds. ii. The flashing light will be on for 0.25 sec and off for 0.75 sec. iii. If button A has been pushed 5 times the light will not flash until the system is reset. iv. The system can be reset by pressing button B.	**4**

4C. Write the significance of the main control computer in DCS **2**

5A. Explain all five general levels in control system of an industrial factory using PLC. **4**

5B. Explain split range operation of HART protocol and mention the need of isolating amplifier in the HART protocol. **4**

5C. A temperature control system consists of two thermostats with a setting of 400^0 C and 600^0 C to activate a heating element. Develop ladder logic and sequential function chart that the temperature should be maintained in between 400^0 C to 600^0 C (i.e heating element remain ON up to 600^0 C in increasing mode and remain OFF up to 400^0 C in decreasing mode). Write ladder logic for the above. **2**

6A. Explain the basic functional requirements of DCS system. **4**

6B. Draw the PLC PID instruction and describe the PID controller. **4**

6C. Without simplification draw Ladder logic and digital circuit for the following expression **2**

$$Y = \overline{\overline{C}\left(\overline{A} + \left(\overline{\overline{A} + (\overline{B}\overline{C}(A + \overline{B}\overline{\overline{C}}))}\right)\right)}$$

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