MANIPAL INSTITUTE OF TECHNOLOGY
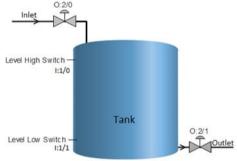## MANIPAL
(A constituent unit of MAHE, Manipal)

I SEMESTER M. TECH (Embedded Control and Automation)
END SEMESTER EXAMINATION DECEMBER 2023
Industrial Automation and Drives (ICE 5115)
Note: Answer All questions.

Time:3 Hours   05-12-2023   **MAX. MARKS: 50**

Q. No	Question	M	CO	PO	BL
1A	Sketch the architecture of ABB system 800xA DCS	2	4	1-6	2
1B	Illustrate and interpret the different levels of the automation pyramid.	3	1	1-6	3
1C	One open tank is installed in the plant in which liquid level is to be controlled. When the level reaches the Level Low, Outlet flow is blocked, and inlet flow is allowed until high level is achieved. When Level High is detected, outlet flow is allowed, and inlet flow is blocked. Develop a ladder logic program to implement the above problem.	5	3	1-6	5

Q. No	Question	M	CO	PO	BL
2A	Design a Burglar Alarm for a house. This alarm will be activated if an unauthorized person is detected by a Window Sensor or a Motion Detector. Implement this Alarm System using Ladder Diagram programming language.	2	3	1-6	5
2B	There are four outputs R, S, T and U. R starts immediately when an input is energized. S starts 4 seconds later. T starts 5 seconds later than S. U goes on 1.5 seconds after S. One switch turns off all the outputs off. Develop and ladder logic program to realize the above problem.	3	3	1-6	5
2C	Discuss, the different segment hardware used in the fieldbus physical layer to transmit and receive signal across the network.	5	2	1-6	2
3A	For a typical single-step stepper motor with a step rate of 5 steps / second and 15°/step, calculate the rpm after 100 seconds.	2	5	1-6	4
3B	Demonstrate how Profibus DP implements completely decentralized high-speed communication to connect to a central controller.	3	2	1-6	3

3C	Develop a ladder logic program to implement the following arithmetic equation. $z = \sqrt{x}((\sin^{-1}(y))\ln x)e^x$	**5**	**3**	**1-6**	**6**
4A	Describe how SCADA performs its function of monitoring thousands of variables.	**2**	**4**	**1-6**	**2**
4B	Differentiate between RTUs and SCADA Master units.	**3**	**4**	**1-6**	**4**
4C	Discuss the features of ABB System 800xA controller and I/O module.	**5**	**4**	**1-6**	**2**
5A	A 5-V stepper motor is to be micro-stepped with one-tenth steps. Develop the voltage table for the above stepper motor.	**2**	**5**	**1-6**	**6**
5B	A 1.8° stepper motor turns a leadscrew that has 24 threads per inch. a. How many steps will it take to advance the leadscrew 1.25 in.? b. What is the linear distance the leadscrew advances for each step?	**3**	**5**	**1-6**	**4**
5C	Illustrate and interpret the philosophy that establishes the basic definitions, principles, and processes to design, Implement and maintain an alarm system in a DCS.	**5**	**4**	**1-6**	**3**

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