Reg. No.

B. E / B. TECH.DEGREE EXAMINATIONS, MAY 2023

Sixth Semester

EE18603 – INDUSTRIAL AUTOMATION AND NETWORKING

(Electrical and Electronics Engineering)

(Regulation 2018)

TIME:3 HOURS   MAX. MARKS: 100

CO1 Choose and design a suitable measurement system
CO2 Configure a pneumatic / hydraulic circuit as per requirements
CO3 Design and program a PLC system for an application
CO4 Control a PLC through human-machines interfaces and learn basic concepts of DCS, CNCs, IoT and Robotics
CO5 Network PLCs with field devices and supervisory control systems

PART- A (10x2=20Marks)
(Answer all Questions)

		CO	RBT LEVEL
1.	How automation influences the key elements that go into overall production volume and, ultimately, industry profit.	1	4
2.	Brief on the application of IoT in plant automation?	1	3
3.	Represent the solenoid-operated, spring-return to-center, ISO 5599-compliant 4/3 valve.	2	2
4.	Name the issue caused by the simultaneous presence of the reset and set signals at the final control valve. List the methods for resolving this issue.	2	4
5.	Depict a typical PLC scan cycle.	3	2
6.	'The retentive timer must be intentionally reset with a separate signal.' – Justify.	3	4
7.	Enumerate the basic types of HMI.	4	2
8.	Demonstrate the any two advantages of a CNC machine.	4	2
9.	What does the IEEE 1451 standard define?	5	2
10.	Portray the M12 Connector for RS-485 in IP65/67 and its pin assignment.	5	2

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)	(i)	Name two method of non-contact type speed measurement. Explain with schematic diagram the principle of operation of any one of them.	(8)	1	4

			Marks	CO	RBT
	(ii)	What is the function of a Phase Sensitive Detector (PSD) in LVDT circuit? Plot the output voltage versus displacement characteristics of LVDT after PSD.	(6)		

(OR)

			Marks	CO	RBT
(b)	What is the difference between a constant area variable pressure drop flowmeter and a constant pressure drop variable area flowmeter? Explain the construction and working of a constant pressure drop variable area flowmeter.		(14)	1	4

			Marks	CO	RBT
12. (a)	A double acting cylinder is to be controlled using 5/2 directional control valve, single solenoid, spring return. When push button PB1 is pressed, cylinder should extend and remains in that position though PB1 is released. The cylinder is to retract completely when PB2 is pressed. In addition, the cylinder is to remain in the retracted position though PB2 is released. Develop an Electro-pneumatic control circuit with an electrical latching with a) dominant Off and b) dominant On.		(14)	2	4

(OR)

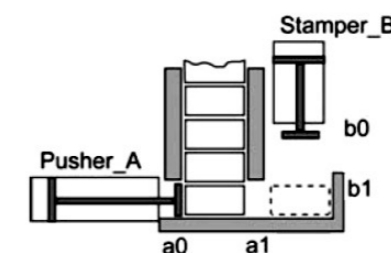|			Marks	CO	RBT
(b)	Figure 1 shows the pneumatic activated stamping machine. First cylinder A extends and brings under stamping station where cylinder B is located. Cylinder B then extends and stamps the job. Cylinder A can return back only when cylinder B has fully retracted. Design a pneumatic circuit using cascade method.		(14)	2	4

Figure 1

			Marks	CO	RBT
13. (a)	(i)	Formulate a scaling equation to program into the AB SLC500 PLC so that 4 mA of current registers as 0 GPM, and 20 mA of current registers as 700 GPM.	(6)	3	4

(ii) A mixer motor is to be used to automatically stir the liquid in a vat **(8)** when the temperature and pressure reach preset values. In addition, manual pushbutton control be permitted to operate at any pressure, but not unless the specified temperature setting has been reached. Develop the process control PLC ladder logic program with typical addressing scheme. Also modify the program if manual pushbutton control be permitted to operate at any pressure, but not unless the specified temperature setting has been reached.

(OR)

(b) Develop a PLC ladder logic program for traffic light control in two **(14)** **3** **4** directions as shown in Figure 2. The timing chart is given in Table 1.

Table 1 Timing chart
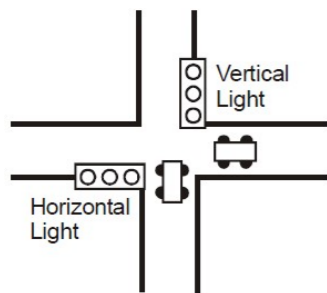
	Red light	Yellow light	Green light	Green light flashes
Vertical light	Y0	Y1	Y2	Y2
Horizontal light	Y10	Y11	Y12	Y12
On time	35 secs	5 secs	25 secs	5 secs

Figure 2

14. (a) Examine the significance components in the Distributed Control System **(14)** **4** **4** (DCS) and Develop the DCS architecture.

(OR)

(b) **(i)** Describe the structure of a typical block in a Part program. **(6)** **4** **4**

(ii) The trajectory of table motion for a CNC machine is given in Figure 3. **(8)** Develop a part program and brief on the meaning of the codes.
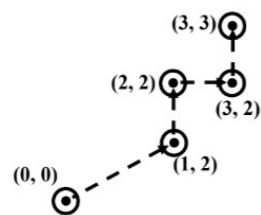

Figure 3

15. (a) Compare and contrast the Fieldbus with 4-20mA current loop. Enumerate **(14)** **5** **4** any two significant aspects of Fieldbus protocol which are not necessarily found in other Protocols.

(OR)

(b) Describe the PROFIBUS Medium Access Protocol in detail. **(14)** **5** **4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

	Marks	CO	RBT LEVEL

16. Design the automation system for an Electric Vehicle industry identifying **(10)** **1** **4** the various functional layers and representing it as an Automation Pyramid.

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