Q. Code:302543

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Sixth -Semester

EE18603 – INDUSTRIAL AUTOMATION AND NETWORKING

(Electrical and Electronics Engineering)

(Regulation2018/ 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Choose and design a suitable measurement system.	**4**
CO 2	Configure a pneumatic / hydraulic circuit as per requirements.	**4**
CO 3	Design and program a PLC system for an application.	**4**
CO 4	Control a PLC through human-machines interfaces and learn basic concepts of DCS, CNCs, IoT and Robotics.	**4**
CO 5	Network PLCs with field devices and supervisory control systems.	**4**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is the fundamental objective of any industry and the role of automation in elevating it?	**1**	**1**
2.	Find the resistance of a platinum resistor at 200°C, if its resistance at 25°C is 100 Ω? For platinum, α=0.00385.	**1**	**3**
3.	Compare and contrast the single and double acting pneumatic cylinders.	**2**	**2**
4.	Draw the symbol of a 4/3 valve, solenoid operated spring return to center, pressure line unloads to tank and locked in center position.	**2**	**2**
5.	Differentiate between the operation of a non-retentive and retentive timer.	**3**	**2**
6.	The MOV instruction is to be used to copy the information stored in word N7:20 to N7:35. What address is entered into the source and the destination?	**3**	**3**
7.	Enumerate the use of HMI's in industrial settings.	**4**	**2**
8.	Distinguish between centralized and distributed control system.	**4**	**2**

9.	Brief on IEEE 1451 family of standards.	**5**		**2**
10.	Summarize the features of modern Ethernet implementation.	**5**		**2**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Analyze the architecture of industrial automation systems emphasizing on the wideness and fastness of components on the time-scale.	**(14)**	**1**	**4**
	(OR)			
(b)	Design an instrumentation amplifier circuit using OP-amp and prove how large gain can be achieved. Enumerate its significant features while incorporating it in a measurement system.	**(14)**	**1**	**4**
12. (a)	An industrial process demands continuous reciprocation of a double acting cylinder and the reciprocation has to automatically stop after 60 cycles. Design a electro-pneumatic circuit to implement process and explain the operation of power and control circuit.	**(14)**	**2**	**4**
	(OR)			
(b)	In a manufacturing industry, sheet metal components are need to be riveted. The riveting process is to be automated using two pneumatic cylinders. A clamping cylinder (A) should first advance and clamp the sheet metal parts. While the parts are clamped, a second cylinder (B) should advance and perform riveting operation. The riveting cylinder should retract and finally the clamping cylinder should retract. Design a pneumatic circuit using cascade method to automate the process and analyze the control valve signal flows.	**(14)**	**2**	**4**
13. (a)	The starting of a 3-phase induction motor using star-delta method is to be automated using PLC. The motor takes 7 seconds to attain its 80% of rated speed when the star-delta transition is to be initiated. Develop a PLC ladder	**(14)**	**3**	**4**

logic program to automate the process. Draw and explain the power circuit and PLC connection diagram.

(OR)

(b) Traffic light control in two direction has to be automated using PLC. The timed sequence of the lights is: **(14) 3 4**

Lights	Red	Yellow	Green	Green flash
Vertical	Y0	Y1	Y2	Y2
Horizontal	Y10	Y11	Y12	Y12
ON time (sec)	35	5	25	5

The sequence then repeats itself.

Develop a PLC ladder logic program to automate the control and explain the sequence of operations.

14. (a) In programming a HMI, depict and detail on the levels of display hierarchy to be followed. **(14) 4 3**

(OR)

(b) With a neat architecture diagram, elaborate the implementation of distributed control system (DCS) to enhance plant automation. **(14) 4 3**

15. (a) Portray the wiring system for conventional point-to-point communication systems and the Fieldbus. Also, compare and contrast the Fieldbus with 4-20mA current loop. **(14) 5 4**

(OR)

(b) Describe the basic architecture of a PROFIBUS network. What are the main components involved? **(14) 5 4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Develop a PLC ladder logic program to implement the process illustrated in Figure 1. The sequence of operation is to be as follows: Normally open start and normally closed stop pushbuttons are used to start and stop the process. When the start button is pressed, solenoid *A* energizes to start filling the tank. As the tank fills, the empty level sensor switch closes. When the tank is full, the full level sensor switch closes. Solenoid *A* is de-energized. The agitate motor starts automatically and runs for 3 min to mix the liquid. When the agitate motor stops, solenoid *B* is energized to	**(10)**	**3**	**5**

empty the tank. When the tank is completely empty, the empty sensor switch opens to de-energize solenoid *B*. The start button is pressed to repeat the sequence.

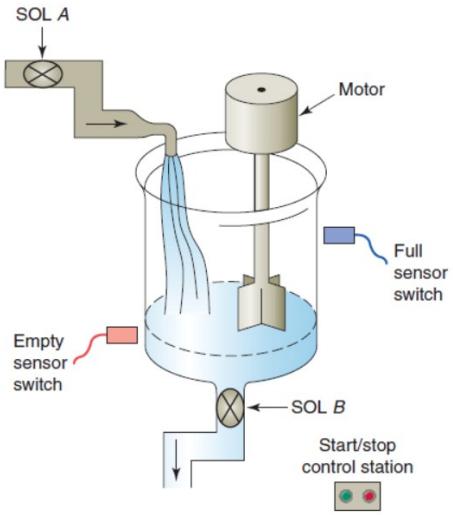

Figure 1

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