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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Fourth, Fifth and Sixth Semester

18EIO133T - INDUSTRIAL AUTOMATION SYSTEMS

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks) Marks BL CO

Answer **all** Questions

1. The first company to make PLC was — 1 2 1
   (A) Seimens (B) Ford
   (C) Mitsubishi (D) Modicon

2. PLC are designed to operate in the _____ environment — 1 1 1
   (A) Home (B) Lab
   (C) Industrial (D) Office

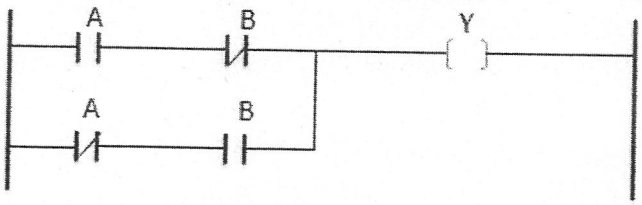
3. _____ separates the higher AC input voltage from logic circuits in PLC — 1 2 1
   (A) Transistor (B) Switch
   (C) Optical Isolator (D) Diode

4. The high-speed counter module is capable of counting _____ pulses per second. — 1 2 1
   (A) 1000 (B) 1000000
   (C) 100000 (D) 10000

5. Which of the following statement is true for a retentive timer? — 1 1 2
   (A) Accumulates time whenever it receives power (B) Retains time when it loses power
   (C) Reset accumulator to zero when it loses power (D) Accumulates time whenever it receives power and Retains time when it loses power

6. An example of a discrete control is — 1 2 2
   (A) Varying the volume of a music system (B) Varying the brightness of a lamp
   (C) Turning ON or OFF a lamp (D) Controlling the speed of a fan

7. The Boolean expression for Y is — 1 1 2



   (A) Y = (A+B') (A'+B) (B) Y = AB' +A'B
   (C) Y = AA'+BB' (D) Y = (A+A')(B+B')

8. Which of the following counts time-based intervals when the instruction transitions from a true to false condition. — 1 2 2
   (A) ON delay timer (B) OFF delay timer
   (C) Retentive timer (D) Pulse timer

9. Choose the number of logic function blocks present in a LCU- C configuration of DCS — 1 1 3
   (A) 40 (B) 160
   (C) 640 (D) 1280

10. Control complexity ratio of a control system is defined as — 1 2 3
   (A) Number of function blocks/Number of inputs (B) Number of outputs/number of inputs
   (C) Number of function blocks/Number of outputs (D) Number of outputs/Number of function blocks

11. The function of high level computing device of a DCS is — 1 2 3
   (A) To do closed loop control (B) To interact with LCU
   (C) To interface with process (D) To perform plant management

12. When was the first DCS introduced in the market — 1 2 3
   (A) 1975 (B) 1960
   (C) 1985 (D) 2000

13. An operator interface should be designed in such a way that the operator performs the particular task effectively with minimal error; this is in short referred to as---- of the system — 1 2 4
   (A) Ecology (B) Economics
   (C) Ergonomics (D) Efficiency

14. In order to ensure safe backup of critical information, one of the following step is preferred — 1 2 4
   (A) In order to ensure safe backup of critical information, one of the following step is preferred (B) Run from a redundant power supply
   (C) Store relatively less amounts of data (D) operator

15. Maximum number of group displays that can be configured in a universal station is — 1 2 4
   (A) 50-100 (B) Less than 200
   (C) 400-500 (D) More than 500

16. Identify the hardware element in a process that is needed for alerting the operator. — 1 2 4
   (A) Controller (B) Annunciator
   (C) comparator (D) Error detector

17. What does SCADA stand for? — 1 2 5
   (A) Supervisory Control and Data Analysis (B) System Control and Data Acquisition
   (C) Supervisory Control and Data Acquisition (D) Security Control and Data Automation

18. In a SCADA system, what is the role of the Human-Machine Interface (HMI)? — 1 2 5
   (A) To regulate data flow (B) To analyze data patterns
   (C) To provide a graphical interface for operators to interact with the system (D) To send commands to remote devices

19. Which component of a SCADA system is responsible for data storage and retrieval? — 1 2 5
   (A) Historian (B) RTU (Remote Terminal Unit)
   (C) HMI (Human-Machine Interface) (D) PLC (Programmable Logic Controller)

20. SCADA systems are primarily designed for which type of monitoring and control? 1 2 5
(A) Global monitoring and control across multiple continents
(B) Remote monitoring and control of distributed processes
(C) Regional monitoring and control within a city
(D) Local monitoring and control within a single room

	Marks	BL	CO
PART - B (5 × 4 = 20 Marks)			
Answer **any 5** Questions			
21. Illustrate the operation of an inductive proximity sensor	4	2	1
22. Compare PLC and Computer.	4	2	1
23. Write short notes on Timer in PLC	4	1	2
24. Show each of the following equations as a ladder logic program i) Y= AB'+A'B+C'D' ii) Y= A+BC+DEF'	4	2	2
25. List the difference between centralized and DCS setup	4	2	3
26. List the different types of displays in Operator Display	4	2	4
27. Write short notes on System components of SCADA	4	2	5
	Marks	**BL**	**CO**
PART - C (5 × 12 = 60 Marks)			
Answer **all** Questions			
28. (a) i)Summarize the differences between capacitive and inductive proximity sensors ii)List the functions of discrete IO module	12	2	1
(OR)			
(b) i)Explain the architecture of PLC with a neat figure ii)Discuss the working of any 2 output devices used in a PLC	12	3	2
29. (a) There are 3 mixing devices on a processing line A, B, C. After the process begins mixer-A is to start after 10 seconds elapse, next mixer- B is to start 20 second after A. Mixer-C is to start 30 seconds after B. All then remain ON until a master enable switch is turned off. Write PLC ladder diagram, and realize the same.	12	2	3
(OR)			
(b) Develop the ladder diagram for a one way traffic light control system. When start button is pressed, Red light will be ON for 30s after which yellow light is ON for 5s then green light is ON for 25s and this process continues. There is a start and stop button to control the system.	12	2	4
30. (a) Illustrate the hardware components of a DCS with neat sketch.	12	2	5
(OR)			
(b) Show the basic functions of LCU and explain its hardware	12	2	5
31. (a) Explain the responsibility of operators in distributed control system?			
(OR)			
(b) Explain the Architectural Alternatives of high level operator interface			
32. (a) Explain the Dependence on Communications and computers in SCADA			
(OR)			
(b) Explain the operation of Remote terminal unit			

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