KUMARAGURU
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B.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EII6201: Industrial Automation

COURSE OUTCOMES

CO1: Apply the design aspects of industrial automation.

CO2: Build PLC program and logic controllers with case study

CO3: Develop PLC diagram &implement the Automation technique used in Industry.

CO4: Solve engineering problems for Field Automation and analyse their safety/redundancy.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1. Mention any four input and output list in automation.   CO1 [K_2]

2. Draw the ladder diagram for the sequence: CO3 [K_3]

   In an industry a pilot light is to go ON when a count reaches 23.

3. Sketch the Relay and Ladder circuit for the Boolean equation   CO2 [K_3]

$$X = \overline{A + B.C + \overline{\overline{D}}}$$

4. Draw the ladder diagram for the given sequence.   CO3 [K_3]

   A motor and its lubrication pump motor are both running. Lubrication for main motor bearings is required during motor coast-down. After the main motor is shutoff, the lubricating pump remains ON for a time corresponding to coast-down time. A lubricating pump remains ON for 25 seconds after the main system is shutdown.

5. List the advantages of PLC.   CO2 [K_2]

6. Draw the PLC operation cycle.   CO2   [K$_2$]

7. An output is ON if the input is less than 45 or equal to 50. Sketch the ladder diagram for the sequence using data compare instruction.   CO3   [K$_3$]

8. Set up a process range PLC program following the specification. The nominal value or set point is 16.75 inches. The tolerances are +0.25 and −0.25 inch. Show that the resulting PLC calculated limits are correct using ladder diagram.   CO3   [K$_3$]

9. Compare HMI and SCADA   CO4   [K$_2$]

10. Outline the role of RTU in Industrial Automation   CO4   [K$_2$]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Describe in detail about architecture of Distributed Control System (DCS) with neat diagram.   16   CO4   [K$_2$]

12. a) Develop ladder program for the given math operation.   6   CO2   [K$_3$]

     A=(S+T-U) *(R/V), Select S=50, T=25, U=10, V=2, R=15.

   b) Describe in detail about PID function block used in PLC.   10   CO2   [K$_3$]

13. a) Draw the schematic diagram of cotton classing system and explain the operation with suitable ladder diagram.   16   CO4   [K$_3$]

14. a) Draw the ladder diagram and write the algorithm for the given sequence of operation.   6   CO3   [K$_3$]

     There are four outputs: A, B, C and D. A start immediately when an input is energized. B starts 10 seconds later. C starts 20 seconds later than B. D goes on 5 seconds after C. One switch turns all output OFF.

   b) Develop a ladder diagram for the stacking operation. The sequences are   10   CO3   [K$_3$]

     When the ON button is pushed, a stacker (S) starts stacking plywood sheets at position A. Stack height is controlled by a PLC counter function, not a height sensor. When 14 parts are stacked, the conveyor (V) goes ON and moves the

stack to position B. A sensor is used to stop the conveyor at B. At B, paint (P) is applied for 20.0 seconds. After painting is complete, the conveyor is restarted manually. The conveyor then moves parts to position C. At position C the stack stops automatically and the stack is removed manually. The stop button stops the process any time it is depressed. Assume that only one stack is ON the conveyor at a time. Add limit switches and other devices as required.
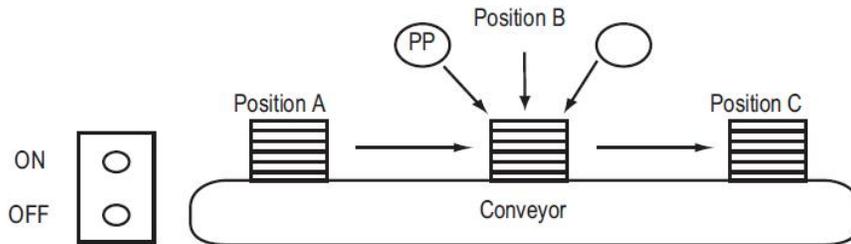
15.	a)	Explain in detail on the different types of Industrial Communication Protocol used in DCS.	8	CO4	[K$_2$]
	b)	Summarize the procedure to select hardware and software components for an application using automation.	8	CO4	[K$_2$]
16.	a)	Draw and explain the architecture of PLC.	8	CO1	[K$_1$]
	b)	Illustrate in detail about AC Input module with neat schematic diagram.	8	CO1	[K$_1$]

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