Seat No. _____

H-003-1154001

M. Sc. (Electronics) (Sem. IV) (CBCS) Examination

April - 2023

Paper - 13 : Automation with PLC & SCADA

## Faculty Code : 003
Subject Code : 1154001

Time : $2\frac{1}{2}$ / Total Marks : 70

1 Answer the following questions in brief : (any seven)   **14**
   (1) Write full names for PLC and SCADA.
   (2) Draw standard symbols for control relay, lamp, push button and level switch.
   (3) Enlist programming languages for PLC. Explain Boolean language in brief.
   (4) Draw ladder rung to realize following logic.

   $CR1 = A \cdot B + C \cdot \overline{A}$

   (5) Enlist various PLC input and output devices.
   (6) Enlist various data handling functions available for a general PLC.
   (7) Explain 'CYCLE' in context of machine control terminology.
   (8) Enlist various applications of PLC.
   (9) What are applications of SCADA?
   (10) Draw the architecture of PLC.

2 Attempt any two of the following questions :   **14**
   (1) Write a detailed note on file system of SCL 500 series PLCs.
   (2) Write a ladder program for Over-head Tank Water Level Controller and Indicator described below.
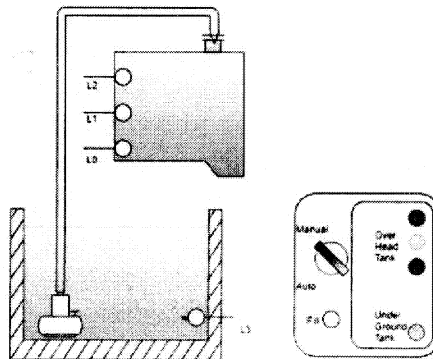
- An over-head tank is to be filed from underground tank using a submersible pump. 3 Level sensors are fitted in over-head tank of bottom, middle and upper level. A level sensor is placed in the under-ground tank of the level of submersible pump. All level sensors fetch high output, when the water level exceeds the sensor.

- Using Auto / Manual button either of the modes can be selected.

- In manual mode, pump is switched ON or OFF using ON/Off switch. When the over-head tank is full or when the under-ground tank is emply the pump should be switched off.

- In auto mode, the fill switch is disabled. When the water level in over-head tank falls below L0, the pump should start filling it. When the over-head tank is full or when the under-ground tank is emply the pump should be switched off.

(3) Describe TON and TOF instructions with all details required.

3 Answer the following questions :
(1) Explain Examine if closed (XIC) and Examine if Open (XIO) instructions.   5
(2) Draw to ladder diagrams to realize a Latched output and an XOR gate.   5
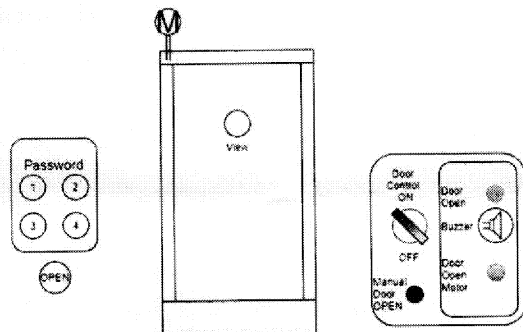(3) Describe COPY and FILL instructions.   4

OR

3 Answer the following questions :
(1) Describe logical instructions of a PLC.   7
(2) Write a detailed note on Counter instructions.   7

**4** Answer the following questions :
(1) Describe in detail comparison instructions.   7
(2) Write a ladder program for password protected home-door control system described below :   7

- A door is opened with Motor M. Outside the door is a keyboard to feed password. Set password is 1423. Family member can access the door using password, while others can press OPEN button to ring doorbell.
- When the keys are pressed in correct sequence form the keyboard, the door should be opened for 10 seconds.
- When non-family member presses the OPEN switch outside the door, the bell rings. This latches the Door Open indicator. When the bell rings, person in house can see through the view-port in the door and can allow door to open using Manual Door Open switch. When the switch is pressed the door is opened for 10 seconds and the Door Open indicator is unlatched.
- Irrespective of the way the door is opened, after 10 seconds, if should be closed.

5 Answer any two of the following questions :
(1) Enlist data handling instructions and explain any 5 of them.　7
(2) Write a detailed note on Timer instructions.　7
(3) Write a ladder program for Batch Mix System described below.　7
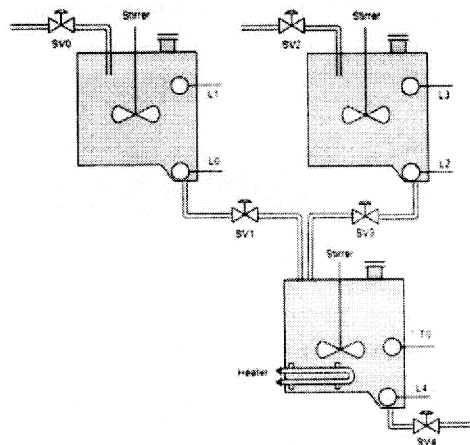
- A batch mixer for two-fluids is to be realized. Two primary tanks are dedicated for fluids 1 and 2 respectively. Each tank has 2 level sensors one at bottom to sense empty tank and another adjustable at desired height to prepare mixture in required proportion. Secondary tank receives fluids from both primary tanks. It has one level sensor at bottom to sense, whether it's empty or not. Temperature sensor T0 fetches high output when the temperature exceeds the value T.

- • When started all tanks must be emptied.
- • Batch preparation starts after all tanks are empty.
- • Valves SV0 and SV2 fill tanks 1 and 2 to levels of upper sensors in respective tanks.
- • After both primary tanks are filled to desired level and if the secondary tank is empty, SV1 and SV3 are opened to pour the fluids to secondary tank, until both are empty.
- • Once secondary tank receives the fluids, the mixture is to be heated to temperature T.
- • After temperature T is attained the heater is switched off and the mixture is drained via SV4 to further process.
- • At any point, the stirrers are on if respective tanks are not empty.

(4) Write a ladder program for Traffic Light System described below: 7
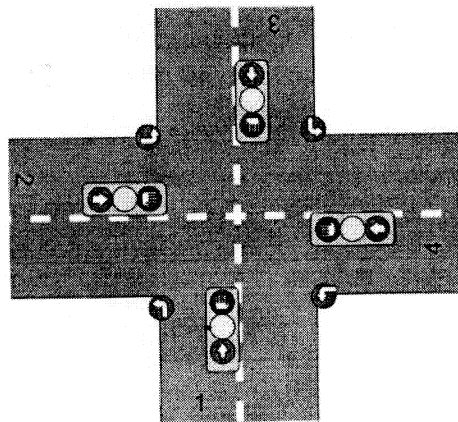
- • The system has no input.
- • The signals for traffic on sideways are always ON (Blinking Mode)
- • Yellow signals will be in blinking mode.
- • Traffic on each of the side is to be cleared (GREEN) for 30 seconds in clock-wise sequence (1 to 4)
- • Traffic on other sides will remain closed when a side is cleared for traffic.
- • 10 seconds prior to opening the traffic yellow light should be turned ON in blinking mode.