



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:VI
Class:TY	Program:B.Tech
Branch Code:ELE	Pattern:2022
Name of Course:PLC and SCADA Automation	Course Code:ELE223014A
Max. Marks:60	Duration:2.30 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Marks CO**

**Question No. 1**

- 1a) What are the different types of input/output modules in a PLC? Compare digital and analog I/O modules, highlighting their differences in function and application. (6) CO1

**Question No. 2**

- 2a) Explain ON-Delay Timer and OFF-Delay Timer with their timing diagrams. (6) CO2

**Question No. 3**

- 3a) Explain the need of an HMI in industrial automation. Draw and explain the PLC–HMI interface architecture with a suitable example. (8) CO2, CO3

**OR**

- 3b) With neat diagrams, explain the working of a VFD and describe how PLC interfaces with motor drives for speed control. (8) CO2, CO3

- 3c) Draw the PLC Ladder Diagram to implement this alarm system using the following conditions: (8) CO2, CO3

1. The alarm should turn ON if any one of the sensors detects an intrusion.
2. The alarm should remain ON (latched) until a Reset pushbutton is pressed.
3. Clearly identify the Inputs and Outputs used in the ladder diagram.

Draw and explain the ladder diagram for this Burglar Alarm System.

**OR**

- 3d) A small warehouse uses three lights—Red, Yellow, and Green—that must turn ON one after another in a fixed sequence. Each light should stay ON for a specific time, and some lights may need to blink. The system must continue the sequence even after a power interruption, so a Retentive Timer (RTO) is required. The operator should start the sequence using a Master Start button and stop it using a Master Stop button. (8) CO2, CO3

**Task:**

1. Using a PLC and Ladder Diagram programming, design the logic to:

2. Turn ON the lights in the correct order using timers.
3. Use an RTO timer so the sequence resumes after power failure.
4. Use a latching Start/Stop circuit for safety.

Show the Ladder Diagram for the complete light-control sequence.

**Question No. 4**

- 4a) Draw and explain the general architecture of a SCADA system. Discuss the roles of MTU, RTU, and communication channels. (8) CO3

**OR**

- 4b) Compare Modbus, Profibus, and DeviceNet protocols based on: (8) CO3  
(i) Topology, (ii) Speed, (iii) Application area, (iv) Physical layer.

- 4c) Explain the OSI model with respect to SCADA communication. Discuss how TCP/IP fits into this model. (8) CO3

**OR**

- 4d) Discuss advantages, disadvantages, and typical applications of SCADA in electrical and process industries. (8) CO3

**Question No. 5**

- 5a) Draw and explain the architecture of a Distributed Control System (DCS). (8) CO5

**OR**

- 5b) Explain the different DCS communication modes and their significance in industrial automation. (8) CO5

- 5c) Describe the design considerations for a DCS. Explain the need of redundancy in DCS with an example. (8) CO5

**OR**

- 5d) Compare PLC, SCADA, and DCS based on: architecture, application area, scalability, and response time. (8) CO5

..... End of question paper.....