

Remote workshop for Fragrance Dispenser



Practice 1 - INSTRUCTION MANUAL FOR THE FRAGRANCE DISPENSER MANAGED BY PLC SIEMENS S7-1200

Theoretical Concepts Questionnaire

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Theoretical Concepts Questionnaire

1. What is the core controller of the Fragrance Dispenser system described in the manual?

- A) Arduino Mega
- B) Siemens S7-1200 PLC.
- C) Raspberry Pi 4
- D) Schneider Modicon

2. What is the primary function of the solenoid valves in this dispenser?

- A) To push the bottles along the conveyor.
- B) To measure the amount of liquid in the main tank.
- C) To act as electronically controlled switches that allow fragrance flow.
- D) To monitor the temperature of the liquid.

3. Which software is used to create the control logic and download it to the PLC?

- A) AutoCAD
- B) Microsoft Project
- C) TIA Portal V17.
- D) LabVIEW

4. What type of sensors are used to detect if a bottle is correctly positioned under the nozzle?
 - A) Capacitive sensors.
 - B) Optical (Photoelectric) sensors.
 - C) Weight scales.
 - D) Temperature probes.

5. How is the 24V DC power typically distributed to the sensors in the electrical cabinet?
 - A) Directly from the high-voltage grid.
 - B) Through a 24V DC Power Supply unit (G1).
 - C) Using AA batteries.
 - D) Via the Ethernet cable only.

6. In a Siemens PLC, what does the "M" terminal usually represent in the DC power connection?
 - A) Motor output.
 - B) Ground / Negative (0V).
 - C) Main phase (230V).
 - D) Memory bit.

7. Why is it important to check the "IP Address" of the PLC before attempting a download?
 - A) To change the name of the PLC.
 - B) To ensure the computer can find the specific PLC on the network.
 - C) To increase the speed of the pump.
 - D) To protect the PLC from viruses.

8. What does "HMI" stand for in the context of the Virtual Control Panel?
 - A) High Maintenance Indicator.

- B) Human-Machine Interface.
 - C) Hydraulic Motor Input.
 - D) Hardware Management Internal.
9. What is the purpose of a "Normally Closed" (NC) contact in a safety circuit?
- A) It only works when the power is off.
 - B) It ensures that if a wire breaks, the system detects an open circuit and stops (fail-safe).
 - C) It saves electricity.
 - D) It is used to start the motor.
10. What physical output does the PLC trigger to fill a bottle with a specific fragrance?
- A) A digital output (Q) connected to a solenoid valve.
 - B) An analog input (IW).
 - C) A internal timer.
 - D) The Ethernet port.
11. What does the "Leds" status "RUN/STOP" in green on the PLC mean?
- A) The PLC is in error mode.
 - B) The PLC is executing the user program correctly.
 - C) The PLC is waiting for a password.
 - D) The PLC has no power.
12. When using the remote workshop, what is the function of the VPN?
- A) To watch videos on the internet.

- B) To create a secure bridge between your home and the laboratory's private network.
- C) To program the PLC without using TIA Portal.
- D) To reset the electrical breakers remotely.
13. Which block in TIA Portal is used to define the names of the inputs and outputs (e.g., Valve_1, Start_Button)?
- A) The Watch Table.
- B) The PLC Tag Table.
- C) The Hardware Catalog.
- D) The OB1 Block.
14. If the system has 4 different fragrances, how many solenoid valves are at least required?
- A) 1
- B) 2
- C) 4
- D) 8
15. What is "Ladder Logic" (KOP)?
- A) A type of electrical cable.
- B) A graphical programming language that resembles electrical relay circuits.
- C) A manual for repairing motors.
- D) A security protocol for the VPN.
16. What should you do if the IP camera shows a liquid spill in the dispenser?
- A) Close TIA Portal.
- B) Press the Emergency Stop (E-Stop) in the control panel.
- C) Wait for the program to finish.
- D) Turn off your monitor.

17. What is the role of the "Pump" in the fragrance dispenser system?
- A) To suck air out of the bottles.
 - B) To provide the pressure needed to move the liquid from the tanks to the valves.
 - C) To rotate the conveyor belt.
 - D) To cool down the PLC.
18. In the electrical diagram, what does the symbol of a coil (rectangle with a diagonal line or circle) usually represent?
- A) A sensor.
 - B) An output actuator, such as a relay or solenoid.
 - C) A battery.
 - D) A fuse.
19. Why is a "Timer" instruction used in the filling logic?
- A) To count how many bottles have passed.
 - B) To control exactly how long a valve stays open to dispense a precise volume.
 - C) To know what time it is in the laboratory.
 - D) To limit the student's session time.
20. What is the "Device View" in TIA Portal used for?
- A) To write the code.
 - B) To visually configure the PLC hardware and modules.
 - C) To chat with the teacher.
 - D) To browse the internet.

Theoretical Concepts Questionnaire. Solutions

21. What is the core controller of the Fragrance Dispenser system described in the manual?

A) Arduino Mega

B) Siemens S7-1200 PLC: The manual title and hardware section explicitly state the system is managed by a Siemens S7-1200 PLC.

C) Raspberry Pi 4

D) Schneider Modicon

22. What is the primary function of the solenoid valves in this dispenser?

A) To push the bottles along the conveyor.

B) To measure the amount of liquid in the main tank.

C) To act as electronically controlled switches that allow fragrance flow: Solenoid valves are actuators that open or close to control the flow of the different fragrances into the bottles

D) To monitor the temperature of the liquid.

23. Which software is used to create the control logic and download it to the PLC?

A) AutoCAD

B) Microsoft Project

C) TIA Portal V17: The manual specifies TIA Portal V17 as the engineering software for programming and configuring the S7-1200.

D) LabVIEW

24. What type of sensors are used to detect if a bottle is correctly positioned under the nozzle?

A) Capacitive sensors.

B) Optical (Photoelectric) sensors.: Photoelectric/optical sensors are the industrial standard for detecting the presence of objects like bottles without physical contact

C) Weight scales.

D) Temperature probes.

25. How is the 24V DC power typically distributed to the sensors in the electrical cabinet?

A) Directly from the high-voltage grid.

B) Through a 24V DC Power Supply unit (G1). Industrial cabinets use a power supply unit (usually labeled G1) to convert the mains AC voltage to 24V DC for control components.

C) Using AA batteries.

D) Via the Ethernet cable only.

26. In a Siemens PLC, what does the "M" terminal usually represent in the DC power connection?

A) Motor output.

B) Ground / Negative (0V). In Siemens documentation, 'L+' is the positive side and 'M' (Mass) is the common/negative side of the 24V DC supply.

C) Main phase (230V).

D) Memory bit.

27. Why is it important to check the "IP Address" of the PLC before attempting a download?

A) To change the name of the PLC.

B) To ensure the computer can find the specific PLC on the network. Each device on a PROFINET/Ethernet network must have a unique IP address to establish communication.

C) To increase the speed of the pump.

D) To protect the PLC from viruses.

28. What does "HMI" stand for in the context of the Virtual Control Panel?

- A) High Maintenance Indicator.
- B) **Human-Machine Interface:** An HMI (like the virtual panel in the browser) is the interface that allows humans to interact with the machine's control system.
- C) Hydraulic Motor Input.
- D) Hardware Management Internal.

29. What is the purpose of a "Normally Closed" (NC) contact in a safety circuit?

- A) It only works when the power is off.
- B) **It ensures that if a wire breaks, the system detects an open circuit and stops (fail-safe).** NC contacts are used for safety (like E-Stops) so that a loss of signal (wire cut) is interpreted as an emergency stop.
- C) It saves electricity.
- D) It is used to start the motor.

30. What physical output does the PLC trigger to fill a bottle with a specific fragrance?

- A) **A digital output (Q) connected to a solenoid valve.** Opening a valve is a discrete "On/Off" action, which is handled by the PLC's digital outputs (labeled with 'Q').
- B) An analog input (IW).
- C) A internal timer.
- D) The Ethernet port.

31. What does the "Leds" status "RUN/STOP" in green on the PLC mean?

- A) The PLC is in error mode.

- B) **The PLC is executing the user program correctly:** A solid green RUN light indicates the CPU is powered and currently running the programmed logic.
- C) The PLC is waiting for a password.
- D) The PLC has no power.
32. When using the remote workshop, what is the function of the VPN?
- A) To watch videos on the internet.
- B) **To create a secure bridge between your home and the laboratory's private network.** The VPN allows your remote computer to act as if it were physically plugged into the laboratory's local network.
- C) To program the PLC without using TIA Portal.
- D) To reset the electrical breakers remotely.
33. Which block in TIA Portal is used to define the names of the inputs and outputs (e.g., Valve_1, Start_Button)?
- A) The Watch Table.
- B) **The PLC Tag Table.** The PLC Tag Table is where you map symbolic names to physical addresses like I0.0 or Q0.0.
- C) The Hardware Catalog.
- D) The OB1 Block.
34. If the system has 4 different fragrances, how many solenoid valves are at least required?
- A) 1
- B) 2
- C) **4** Each fragrance requires its own dedicated valve to be controlled independently by the PLC.
- D) 8

35. What is "Ladder Logic" (KOP)?
- A) A type of electrical cable.
 - B) A graphical programming language that resembles electrical relay circuits:** Ladder (KOP) is the most common language for PLCs, using symbols for contacts and coils.
 - C) A manual for repairing motors.
 - D) A security protocol for the VPN.
36. What should you do if the IP camera shows a liquid spill in the dispenser?
- A) Close TIA Portal.
 - B) Press the Emergency Stop (E-Stop) in the control panel.** Any visual confirmation of a malfunction or hazard requires an immediate stop via the E-Stop.
 - C) Wait for the program to finish.
 - D) Turn off your monitor.
37. What is the role of the "Pump" in the fragrance dispenser system?
- A) To suck air out of the bottles.
 - B) To provide the pressure needed to move the liquid from the tanks to the valves.** The pump is the actuator responsible for fluid displacement in the distribution system
 - C) To rotate the conveyor belt.
 - D) To cool down the PLC.
38. In the electrical diagram, what does the symbol of a coil (rectangle with a diagonal line or circle) usually represent?
- A) A sensor.
 - B) An output actuator, such as a relay or solenoid:** Coils represent the "load" or "output" that the PLC or control circuit is trying to activate.
 - C) A battery.
 - D) A fuse.

39. Why is a "Timer" instruction used in the filling logic?

A) To count how many bottles have passed.

B) To control exactly how long a valve stays open to dispense a precise volume. Since volume is often controlled by time in these systems, timers are essential to manage the filling process.

C) To know what time it is in the laboratory.

D) To limit the student's session time.

40. What is the "Device View" in TIA Portal used for?

A) To write the code.

B) To visually configure the PLC hardware and modules. The Device View shows a graphical representation of the PLC and its expansion modules to configure their properties.

C) To chat with the teacher.

D) To browse the internet.