



Quiz

Exercise 1: (5.0 pts)

Answer the following course-related questions:

1. List the two main components that make up an automated system. (0.5 pts)
2. List two sensors, two pre-actuators, and three actuators. (1.0 pts)
3. List two advantages and two disadvantages of automated systems. (1.0 pts)
4. Provide the diagram showing the organization of the CPU memory in a PLC. (1.0 pts)
5. What is the difference between a compact (monoblock) PLC and a modular PLC? (1.0 pts)
6. What do the initials HMI stand for in a PLC context? (0.5 pts)

Exercise 2: (3.0 pts)

Indicate whether each statement is true or false, and justify your answer if the statement is false.

- a) An LCD display is an actuator. (0.5 pts)
- b) The CPU of a PLC can be designed around a microcontroller. (0.5 pts)
- c) The power rating of the PLC's power supply depends on the number of modules it contains. (0.5 pts)
- d) The PLC's I/O memory contains the PLC program. (0.5 pts)
- e) The S7-1214C CPU communicates with the Personal Computer (PC) via the Profibus. (0.5 pts)
- f) The S7-1214C CPU is powered by a power supply unit that provides a 24V AC voltage. (0.5 pts)

Exercise 03: (06.0 pts)

Parts arrive in a chute and must be placed onto a conveyor belt (TR). The system is equipped with two double-acting cylinders: **Cylinder A** is used to load the part into the tray, and **Cylinder B** is used to place it onto the conveyor belt.

- Actions **A+** and **B+** move the rods of cylinders A and B **outward**, respectively, while actions **A-** and **B-** retract them **inward**.
- Action **TR** activates the conveyor belt.
- Push-button **m** starts the cycle.
- Sensor **d0** detects the arrival of a new part.
- **a0**, **a1**, **b0**, and **b1** are binary sensors (limit switches) that detect the positions of cylinders A and B.

K: Operating mode selector switch:

- If **K = 1**, the system operates **cycle-by-cycle** (each cycle requires a new press on button **m**).
- If **K = 0**, the system operates in **continuous mode** (the cycle automatically repeats without pressing **m** again).

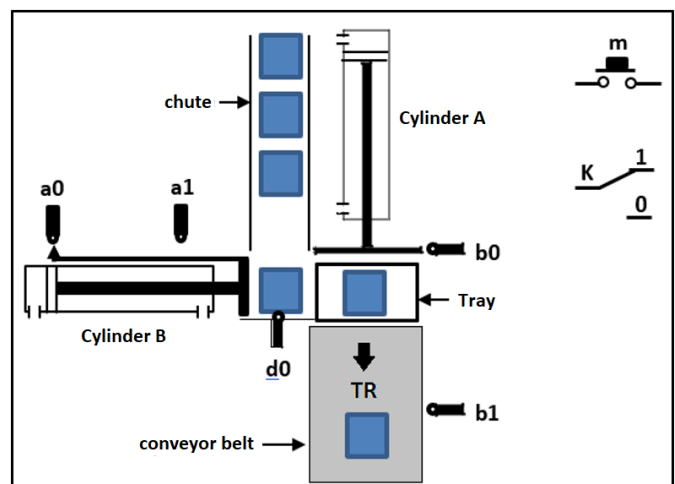
System Operation

Pressing the push-button **m** starts the operation cycle. As soon as a part is detected by sensor **d0**, cylinder A extends (**A+**) to push the part into the tray, then retracts (**A-**) to its initial position.

Next, cylinder B extends (**B+**) to place the part onto the conveyor belt.

When the rod of cylinder B reaches position **b1**, the system simultaneously triggers:

- the retraction of cylinder B (**B-**)
- and the activation of the conveyor belt (**TR**) for a duration $T = 4$ seconds.



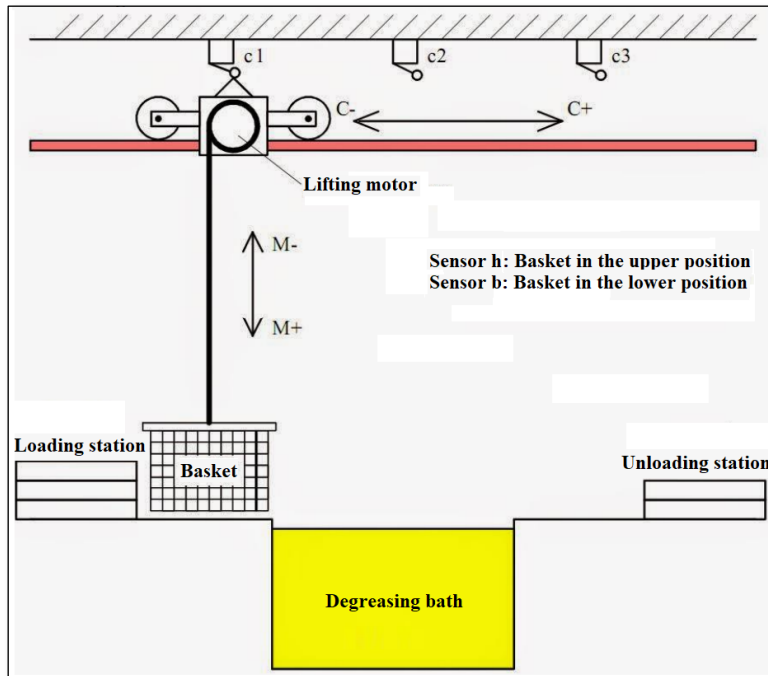
Once the rod of cylinder B returns to position **b0** and the 4-second duration has elapsed, the next cycle can begin.

Note: The cycle can only start if cylinder A is in position **a0** and cylinder B is in position **b0**.

- Identify the inputs and outputs of the system.
- Describe the operation of the control system using a GRAFCET diagram, ensuring it supports both operating modes: cycle-by-cycle and continuous.

Exercise 04: (06.0 pts)

A trolley moves along a rail and positions itself above a tank to clean parts placed in a basket by dipping them into a degreasing bath.



Detailed cycle:

- When the trolley is at the top-left position and the cycle **start button (dcy)** is pressed, the trolley moves above the degreasing tank.
- The basket then lowers into the tank and stays there for 30 seconds.
- After the wait, the basket lifts back up.
- Then, the trolley moves to the far right, where the basket is unloaded.
- Once unloading is complete, the system returns to its initial starting position.

Note:

Loading and unloading the basket is done manually.

To confirm that the basket has been unloaded, the operator must press a push button (*d*).

- Describe the operation of the control system using a GRAFCET diagram.