

Exercise 1

Boolean Algebra

Specification:

1. A generator can be loaded up to 10 kW and is connected to 4 motors of 2, 3, 5 and 7 kW respectively.
2. The motors are attached with rotation sensors (S1, S2, S3 and S4) that provides a 0 signal to the controller as soon as a motor starts rotating.
3. In case of an allowed combination of motor operations an indicator light P will be switched on.

Tasks:

1. Set up the truth table. The inputs are the 4 sensor signals. The output is the indicator light.
2. Derive the DNF that describes the relationship between P and S1~S4.
3. Simplify the DNF, for instance, by applying Karnaugh graph.

Specification:

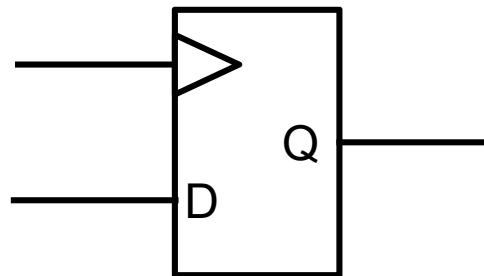
1. The coffee automaton can give out a cup of coffee after the customer has inserted 2€.
2. It accepts either 1€ coin or 2€ coin.
3. After inserting 2€, a button “Coffee” is pressed and the coffee will be given out.
4. After inserting 1€ or 2€ and before the button “Coffee” is pressed, the coin(s) can be given back by pressing the button “Cancel”.

Task:

1. Model the automaton as a Finite State Automaton

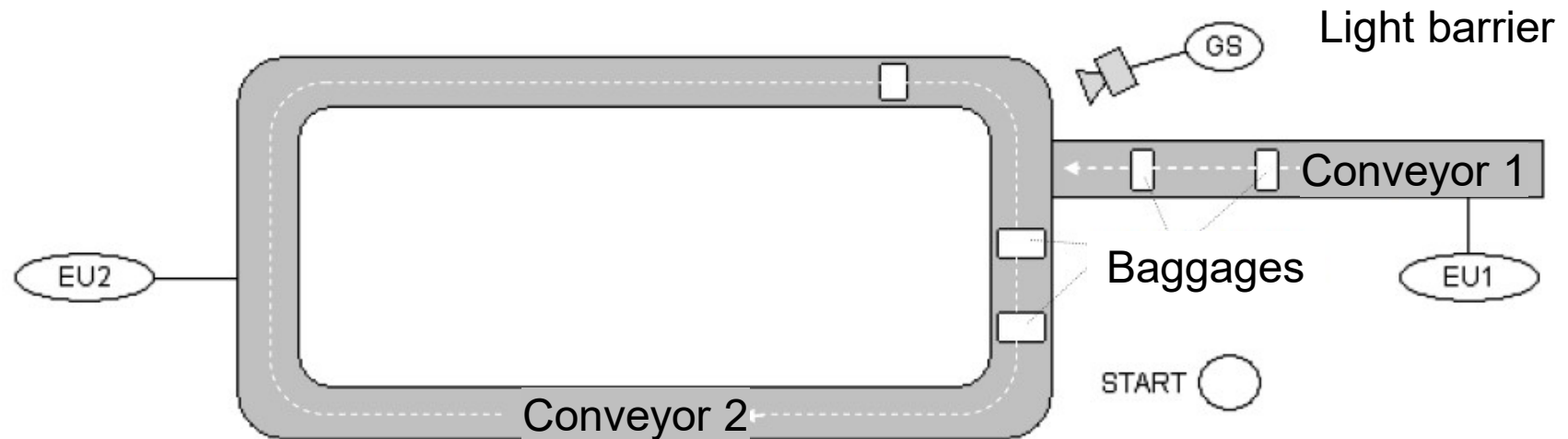
Specifications:

- Flipflops are used as data storage elements. D flipflop is a very commonly used flipflop where „D“ denotes Data or Delay. The nature of D flipflop is following.
- The D flipflop has two inputs, one for data, and another for a clock signal. The rising/falling edge of the clock signal is taken as a trigger (event) and at the instant of this event the value of data input (D) is transferred to the output (Q).



Task:

- Draw Mealy and Moore automata for D flipflop.



Specification:

1. The belt conveyor 1 and 2 are driven, respectively, by motor EU1 and EU2. After pressing the switch "START", conveyor 1 begins to run. After 30s, conveyor 2 begins to run.
2. When the sensor GS detects a baggage (GS=1), conveyor 1 is stopped to avoid collision. If no baggage is detected in 10 seconds, conveyor 1 runs again.
3. After all baggages are on conveyor 2, "START" can be switched off. Conveyor 1 stops running at once. Conveyor 2 will continue running, until no baggages are detected in 120 seconds.