1 EXERCISE 1:

1.1 MEALY STATE MACHINE

In the Mealy state machine, the output value not only depends on the state we are but also depends on the input values. This is to say the output could be represented as a function like $Z = f(X_1.....X_n, Q_1....Q_n)$ where Z: output, X: State and Q:Input event as could be visualize:
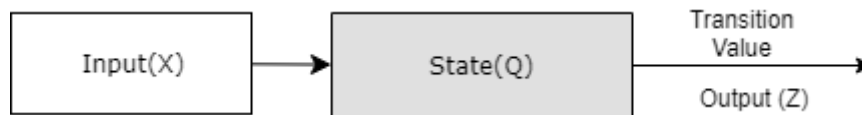

Figure 1.1: Mealy sate machine simple representation

In this exercise, two sensors I and S function as input event to the state machine. Analyzing the possible states and event we obtain the following Mealy machine diagram:
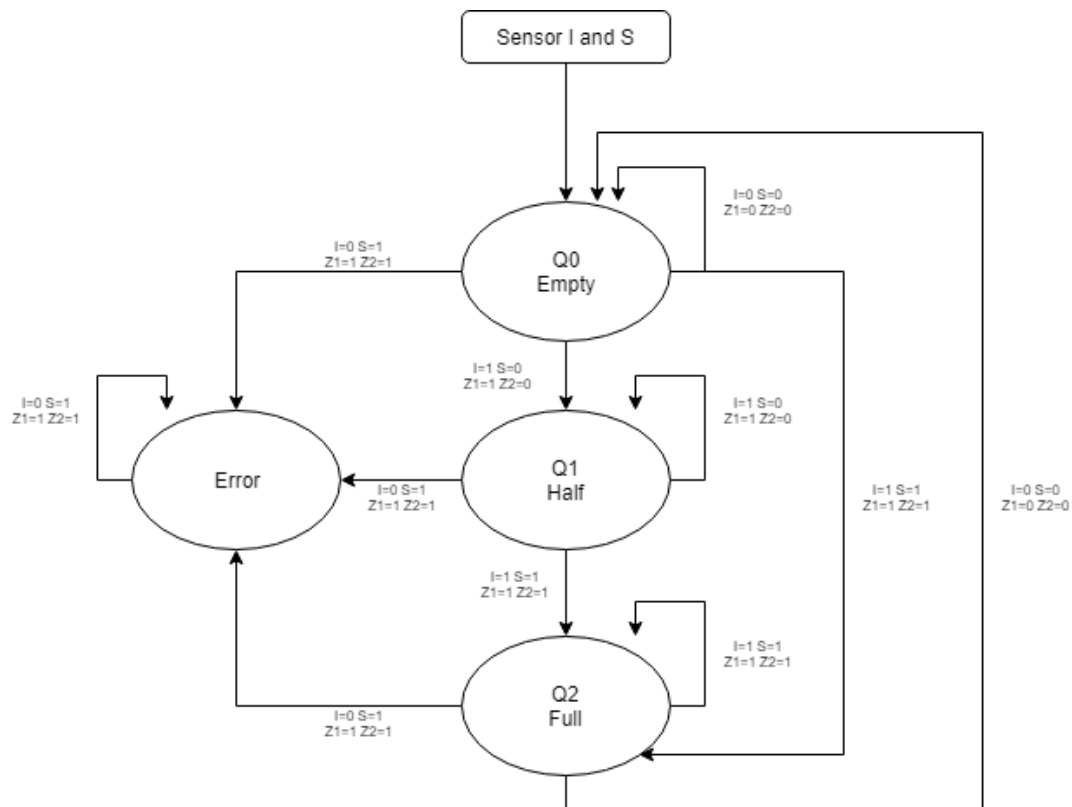

Figure 1.2: Exercise 1: Mealy sate machine flow chart

Which is represented as follow:

State(Q)			Input(X)								
			X1=0 X2=0		X1=0 X2=1		X1=1 X2=0		X1=1 X2=1		
Representation	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	
Empty	0	0	0	0	0	1	1	0	1	1	
Error	0	1	0	0	0	1	1	0	1	1	
Half	1	0	0	0	0	1	1	0	1	1	
Full	1	1	0	0	0	1	1	0	1	1	
Output(Z)	Z1	Z2	0	0	1	1	1	0	1	1	

Table 1.1: Exercise 1: Mealy sate machine
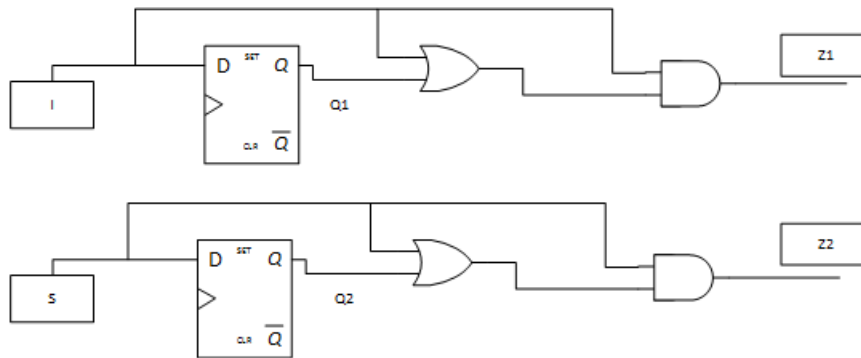
So the logic circuit would be:

Figure 1.3: Exercise 1: Mealy logic circuit

We can notice that the input event and the output event are the same which could make the $Z_N = X_N$ with N: the output or input number, but as mention be in the Mealy state machine the output $Z = f(X_1.....X_n, Q_1....Q_n)$, so we considered essential the use of sate in the circuit is dependent with the state and the input.