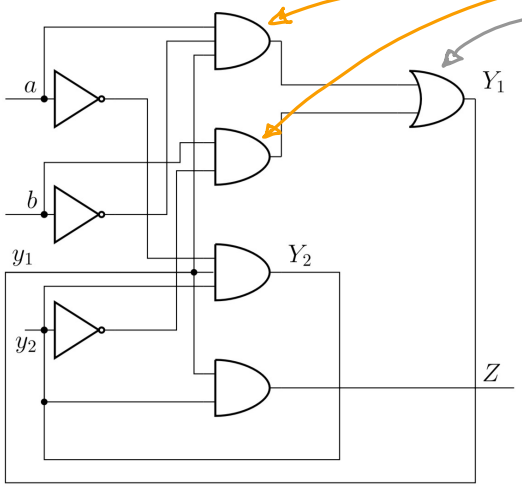
Q1 Logic equations, Muffman table & state graph

a)



$Y_1 = OR(AND(a, \bar{b}, y_1), AND(b, \bar{y}_2))$

$Y_1 = a\bar{b}y_1 + b\bar{y}_2$

$Y_2 = AND(\bar{a}, y_1, y_2) = \bar{a}y_1y_2$

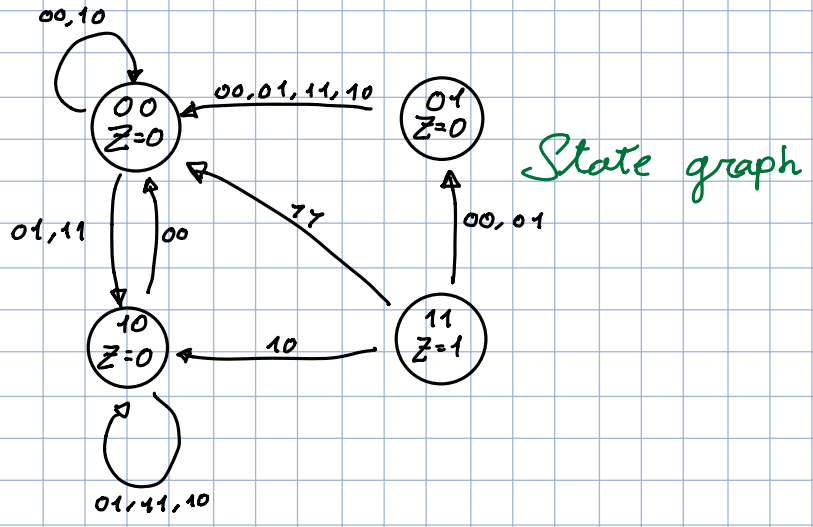
$Z = AND(y_1, y_2) = y_1y_2$

Logic equations

Muffman table

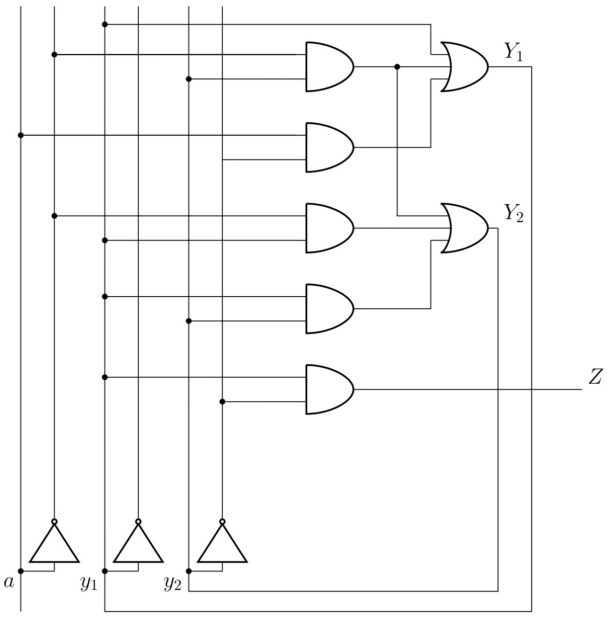
Y_1 Y_2 \ ab	00	01	11	10	Z
0 0	00	10	10	00	0
0 1	00	00	00	00	0
1 1	01	01	00	10	1
1 0	00	10	10	10	0
y_1 y_2					

Put Y_2
Put Y_1



State graph

b)



Logic equations

$Y_1 = +(y_1, \cdot(\bar{a}, y_2), \cdot(a, \bar{y}_2))$

$Y_1 = y_1 + \bar{a}y_2 + a\bar{y}_2$

$Y_2 = +(\cdot(\bar{a}, y_2), \cdot(\bar{a}, y_1), \cdot(y_1, y_2))$

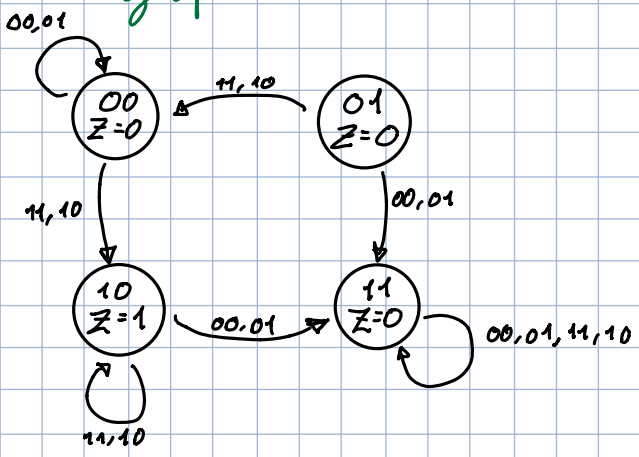
$Y_2 = \bar{a}y_2 + \bar{a}y_1 + y_1y_2$

$Z = \cdot(y_1, \bar{y}_2) = y_1\bar{y}_2$

Muffman table :

Y_1 Y_2 \ ab	00	01	11	10	Z
0 0	00	00	10	10	0
0 1	11	11	00	00	0
1 1	11	11	11	11	0
1 0	11	11	10	10	1
y_1 y_2					

State graph



Q3

$$f(a,b,c,d,e) = \sum_m (0,2,5,7,8,9,10,11,13,23,26,27,29) + \sum_d (3,12,15,18,19,21,22,31)$$

	F	00	01	11	10	de
0	000	1	0	–	1	
1	001	0	1	1	0	
3	011	–	1	–	0	
2	010	1	1	1	1	
4	100	0	0	0	–	
5	101	0	–	1	–	
7	111	0	1	–	0	
6	110	0	0	1	1	
		abc				

$F = \bar{a}b\bar{c} + \overline{ace} + ce + \bar{c}d$

Q2:

Question 2. A door opener is controlled by a password that is controlled using two buttons a and b. We assume that the value associated to each button equals 1 when the button is pressed, 0 otherwise. The door is being opened if the output Z_1 is set to 1, which happens whenever the last button of the password is pressed. The code is the following: press and release a two times, then press and release b and finaly press and release a again. Any wrong sequence sets the output Z_2 to 1, triggering the alarm. Once activated, the alarm stays active whatever the input.

Build the state graph and Huffman table for this problem.

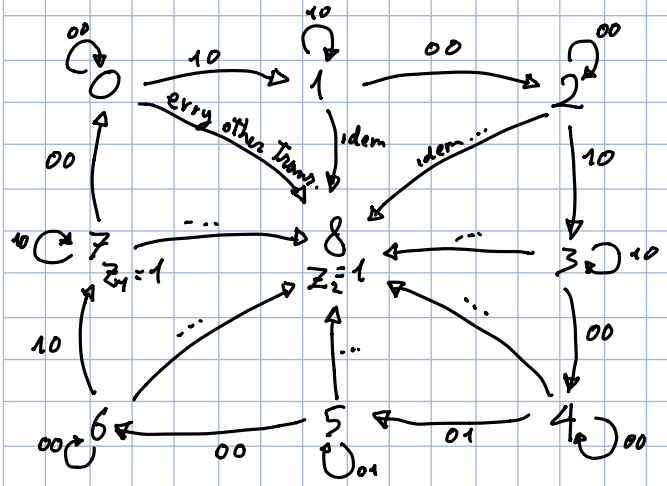
1) Identify states & make a diagram

2) Convert to state graph

ab : 10 → 00 → 10 → 00 → 01 → 00 → 10 → 00 → 1 $Z_1=1$ $Z_2=1$ 8

States : 1 2 3 4 5 6 7

- Stable states
- Alarm state



	ab					
$Y_1Y_2Y_3Y_4$	00	01	11	10	Z_1	Z_2
0000	0000	1000	1000	0001	0	0
0001	0010	1000	1000	0001	0	0
0010	0010	1000	1000	0011	0	0
0011	0100	1000	1000	0011	0	0
0100	0100	0101	1000	1000	0	0
0101	0110	0101	1000	1000	0	0
0110	0110	1000	1000	0111	0	0
0111	0000	1000	1000	0111	1	0
1000	1000	1000	1000	1000	0	1

$y_1y_2y_3y_4$