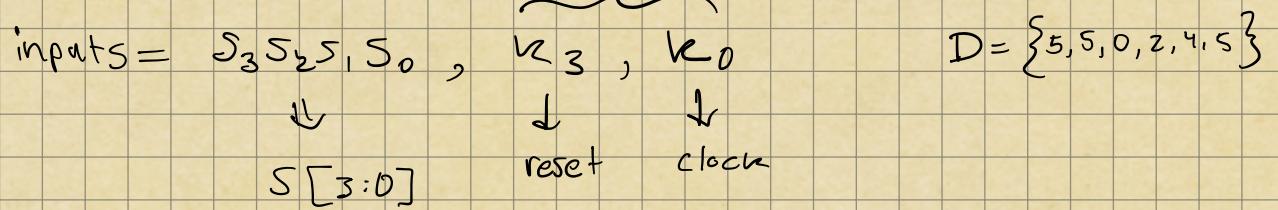
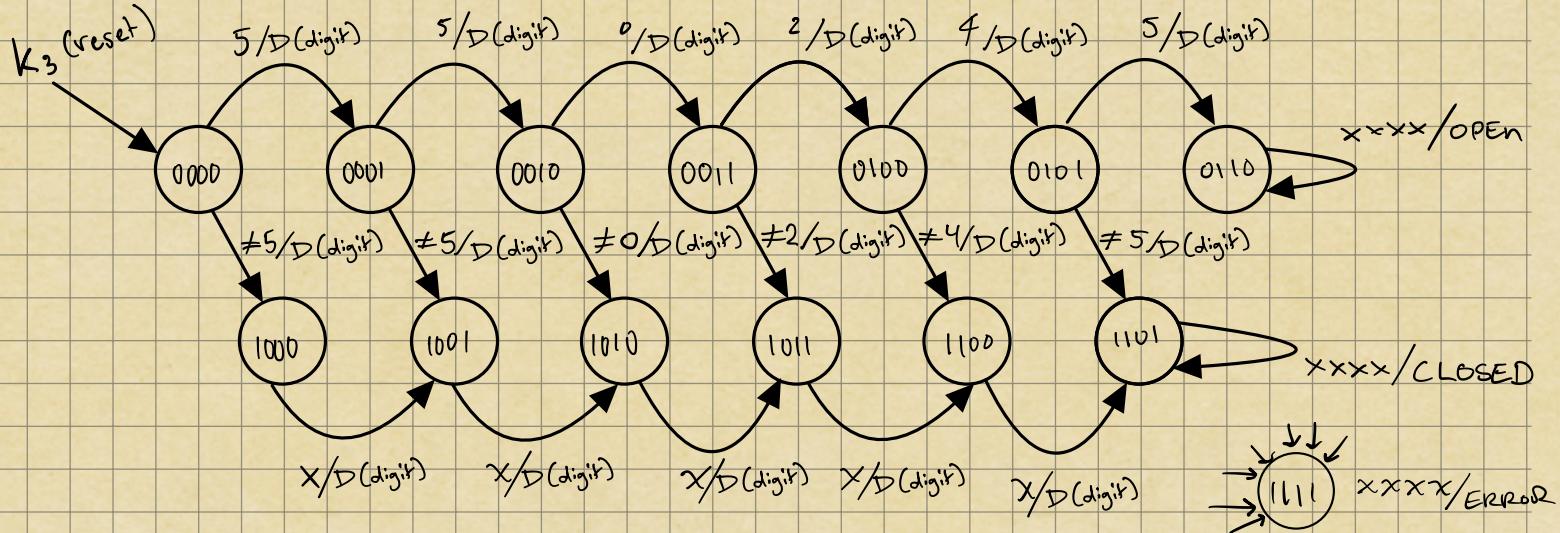


lab3_top.v



outputs = $[5:0] h[6:0]$



State Encoding

1
1

Case (Present State)

'S_{GF}: H_{CO} = n

9: 00110000

'SBF: RL.
---, Close

8: 00000000

'SE: error

7: 11110000

6: 00000010

default: case / inputs SW1

5: 0010010

4: 0011001

3: 0110000

2: 0100100

1: 1111001

0 =
1
2
3
;
9

default: X

3 2 1 0
OPEN → 1 1 1 1 1 1 1

HEX3 = 7'b 1111110 X

HEX2 = 7'b 1100111 X

HEX1 = 7'b 1001111 0000110

HEX0 = 7'b 0010101 0101011

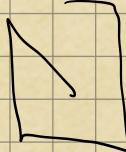
5 4 3 2 1 0
CLOSED → 1 1 1 1 1 1 1

HEX5 = 7'b 1001110

HEX4 = 7'b 0001110

HEX3 = 7'b 1111110

HEX2 = 7'b 1011011



ERROR

R

R

Testbench

[9:0] switches : SW[3:0] used.

[3:0] keys : key0 & key3.

(1) $\text{key}_0 = 0$ $\text{key}_5 = 0$

$SW[3:0] \Rightarrow 0101_2 = "5"$. * note: random
6 digit binary

timestep 5 secn.

(2) $0100_2 = "4"$

(3) $0000_2 = "0"$

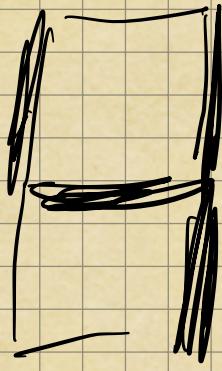
(4) $0010_2 = "2"$

(5) $010_2 = "4"$

(6) $0101_2 = "5"$

Output is? Expected output is OPEN.

0011001



| P_3 | P_2 | P_1 | P_0 | S_3 | S_2 | S_1 | S_0 | n_3 | n_2 | n_1 | n_0 |
|--------------|-------|-------|-------|---------|-------|-------|-------|---------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | | |
| \downarrow | | | | 0 0 0 0 | | | | 0 0 0 0 | | | |
| \downarrow | | | | 1 0 0 1 | | | | 1 0 0 0 | | | |
| \downarrow | | | | 1 0 0 1 | | | | 0 0 1 0 | | | |
| \downarrow | | | | 0 0 0 0 | | | | 0 0 0 0 | | | |

| n_3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| $P_3 P_2 P_1 P_0$ | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 |
| 1000 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0100 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | | | | | |
|------|---------|---|---------------------------|--|---------|---------------------------------|--|
| | | ↓ | { 1 0 1 0 | | 0 1 1 0 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| | | | 1 0 0 1 } 1 0 0 1 | | 1 1 1 0 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| 3rd | | | 0 0 0 1 } 1 0 1 1 | | 0 0 1 0 | 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| | | | 1 0 0 1 } | | 0 0 1 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| | | | 1 0 0 1 0 0 1 0 0 1 0 0 } | | 1 0 1 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| 4th | | | 0 0 0 0 } 1 1 0 0 | | 0 1 1 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| | | | 1 0 0 1 } | | 0 1 0 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| | b 1 0 0 | | 0 1 0 0 0 1 0 1 } 1 1 0 1 | | 1 0 0 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| 5th | | | 0 0 0 0 } 1 1 0 1 | | 0 0 0 1 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |
| last | | | 1 0 0 1 } | | | | |
| FIR | | | 1 1 1 1 X X X X 1 1 1 1 } | | | | |
| | | | 0 1 1 0 X X X X 0 1 1 0 } | | | | |
| | | | 1 1 0 1 X X X X 1 1 0 1 } | | | | |
| | | | 1 0 0 0 X X X X 1 0 0 1 } | | | | |
| | | | 1 0 0 1 X X X X 1 0 1 0 } | | | | |
| | | | 1 0 1 0 X X X X 1 0 1 1 } | | | | |
| | | | 1 0 1 1 X X X X 1 1 0 0 } | | | | |
| | | | 1 1 0 0 X X X X 1 1 0 1 } | | | | |

$$\bar{f} = \begin{matrix} 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{matrix} \checkmark$$

$$\begin{matrix} 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 \end{matrix} \checkmark$$

$$= \overline{P_3} \vee \overline{S_3} \vee (S_2 \wedge \overline{S_1} \wedge S_0)$$