

*CSE 234 Lab 3 - 200104004034 - Yeşim Yalın

* $14 = 1+4 = 5 \Rightarrow 1 \text{ output}$ } if 5 or 7 output 1
 $25 = 2+5 = 7 \Rightarrow 1 \text{ output}$ } else output = 0

* inputs are 5 bit numbers

$$\begin{array}{r} 2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0 \\ 16 \quad 8 \quad 4 \quad 2 \quad 1 \end{array}$$

16
10
32
max
number

* For 5:
 $0, 5 \rightarrow 5$
 $1, 4 \rightarrow 14$
 $2, 3 \rightarrow 23$

* For 7:
 $0, 7 \rightarrow 7$
 $1, 6 \rightarrow 16$
 $2, 5 \rightarrow 25$
 $3, 4 \rightarrow 34$

Total of 6 numbers give 1 output rest give 0

$5 \rightarrow 00101$ } $7 \rightarrow 00111$
 $14 \rightarrow 01110$ } $16 \rightarrow 10000$
 $23 \rightarrow 10111$ } $25 \rightarrow 11001$

* Truth Table

a_4	a_3	a_2	a_1	a_0	Decimal	Output
0	0	0	0	0	0	0
0	0	0	0	1	1	0
0	0	0	1	0	2	0
0	0	0	1	1	3	0
0	0	1	0	0	4	0
0	0	1	0	1	5	1*
0	0	1	1	0	6	0
0	0	1	1	1	7	1*
0	1	0	0	0	8	0
0	1	0	0	1	9	0
0	1	0	1	0	10	0
0	1	0	1	1	11	0
0	1	1	0	0	12	0
0	1	1	0	1	13	0
0	1	1	1	0	14	1*
0	1	1	1	1	15	0

$$m_5 = a_4' a_3' a_2 a_1' a_0'$$

$$m_7 = a_4' a_3' a_2 a_1 a_0$$

$$m_{14} = a_4' a_3 a_2 a_1' a_0'$$

a_4	a_3	a_2	a_1	a_0	Decimal	Output	
1	0	0	0	0	16	1	* $m_{16} = a_4 a_3' a_2' a_1' a_0'$
1	0	0	0	1	17	0	
1	0	0	1	0	18	0	
1	0	0	1	1	19	0	
1	0	1	0	0	20	0	
1	0	1	0	1	21	0	
1	0	1	1	0	22	0	
1	0	1	1	1	23	1	* $m_{23} = a_4 a_3' a_2' a_1 a_0$
1	1	0	0	0	24	0	
1	1	0	0	1	25	1	* $m_{25} = a_4 a_3 a_2' a_1' a_0$
1	1	0	1	0	26	0	
1	1	0	1	1	27	0	
1	1	1	0	0	28	0	
1	1	1	0	1	29	0	
1	1	1	1	0	30	0	
1	1	1	1	1	31	0	

$$F(a_4, a_3, a_2, a_1, a_0) = \sum (m_5, m_7, m_{14}, m_{16}, m_{23}, m_{25})$$

$$F(a_4, a_3, a_2, a_1, a_0) = a'b'cd'e + a'b'cde + a'bcde' + ab'c'd'e' + ab'cde + abc'd'e$$

* Simplification: Use XNOR gate = $A'B' + AB$

A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

* Karnaugh Map

	D'E'	D'E	DE	DE'
a'b'c'	0	0	0	0
a'b'c	0	1	1	0
a'bc	0	0	0	1
a'bc'	0	0	0	0
abc	1	0	0	0
ab'c	0	0	1	0
abc	0	0	0	0
abc'	0	1	0	0

$$F = a'b'ce + b'cde + a'bcde' + ab'c'd'e' + abc'd'e$$

$$\star F = a'b'ce + b'cde + a'b'cde' + ab'c'd'e' + abc'd'e$$

$$\star F = a'b'c'd'e + a'b'c'd'e + a'b'c'd'e' + ab'c'd'e' + ab'cde + abc'd'e$$

$\begin{matrix} 5 & 7 & 16 & 23 & 25 \end{matrix}$
 $a'c(b'd'e + bde')$

5-14 using XNOR
7-23 simplifying

$$F = a'c(b'd'e + bde') + b'cde + ab'c'd'e' + abc'd'e$$

\downarrow
 $(b'd'e) \text{XNOR} (bde')$

b	d	e
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1