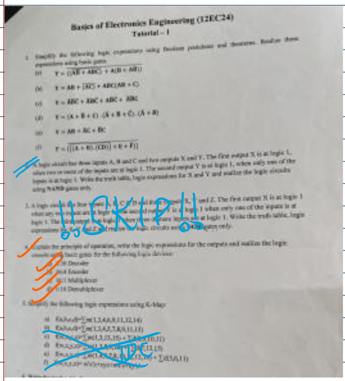
ec u3 tutorials

Monday, December 2, 2024 9:42 PM



②

A	B	C	X	Y
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	0

$X = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$

$= \bar{A}BC + A\bar{B}C + AB(\bar{C}+C) = C(\bar{A}B + A\bar{B}) + AB(\bar{C}+C)$

$= C(A \oplus B) + AB$

~~$+ A(B + \bar{B}C)$~~

~~$+ A(B+C)$~~

$= \bar{A}BC + AB + AC$

$= B(A + \bar{A}C) + AC$

$= B(A+C) + AC$

$= AB + BC + AC$

$BC + A(B \oplus C) \rightarrow \overline{\overline{BC} \cdot \overline{A(B \oplus C)}}$

$\overline{\overline{AB} \cdot \overline{C(A \oplus B)}}$

$Y = A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C$

$= \bar{A}(\bar{B}C + B\bar{C}) + A\bar{B}\bar{C}$

$= \bar{A}(B \oplus C) + A\bar{B}\bar{C}$

$\hookrightarrow \overline{\overline{\bar{A}(B\oplus C)} \cdot \overline{A\bar{B}\bar{C}}}$

$B \oplus C$ $\quad \bar{A}$ $\quad \overline{\bar{A}(B \oplus C)}$

$\overline{\overline{\bar{A}(B\oplus C)} \cdot \overline{A\bar{B}\bar{C}}}$

XOR/NAND:

$A \oplus B$

$= \overline{\overline{\bar{A}B + A\bar{B}}}$

$= \overline{\overline{\bar{A}B} \cdot \overline{A\bar{B}}}$

$= \overline{(\bar{A}+B)\cdot(A+\bar{B})}$

$= \overline{(\bar{A}+AB)(\bar{B}+AB)}$

$= \overline{\overline{(\bar{A}+AB)} \cdot \overline{(\bar{B}+AB)}}$

$= \overline{\overline{A \cdot \overline{AB}} \cdot \overline{B \cdot \overline{AB}}}$

$\hookrightarrow$ 4NAND

$B \oplus C$

$= \overline{\overline{B\bar{C} + \bar{B}C}}$

$= \overline{\overline{B\bar{C}} \cdot \overline{\bar{B}C}}$

$= \overline{(\bar{B}+C)(B+\bar{C})}$

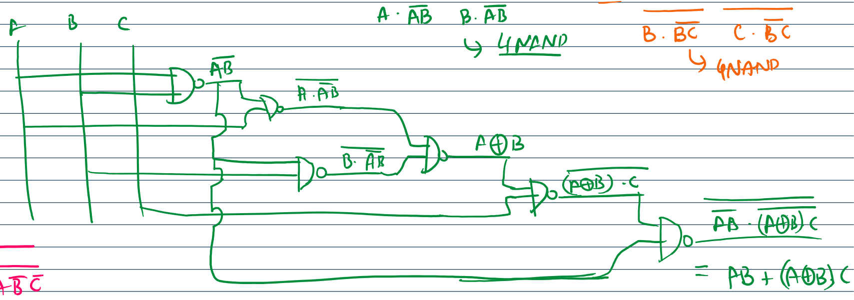
$= \overline{(\bar{B}+BC)(\bar{C}+BC)}$

$= \overline{\overline{(\bar{B}+BC)} \cdot \overline{(\bar{C}+BC)}}$

$= \overline{\overline{B \cdot \overline{BC}} \cdot \overline{C \cdot \overline{BC}}}$

$\hookrightarrow$ 4NAND

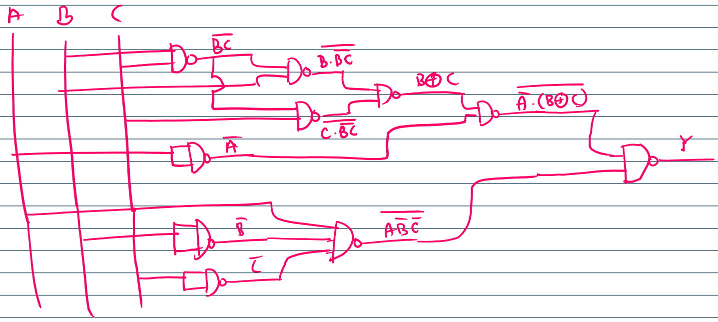
A	B	C	D	X	Y	Z
0	0	0	0	0	0	0
0	0	0	1	0	1	0
0	0	1	0	0	1	0
0	0	1	1	1	0	0
0	1	0	0	0	1	0
0	1	0	1	1	0	0
0	1	1	0	1	0	0
0	1	1	1	0	0	1
1	0	0	0	0	1	0
1	0	0	1	1	0	0
1	0	1	0	1	0	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	0	0	1
1	1	1	0	0	0	1
1	1	1	1	0	0	1



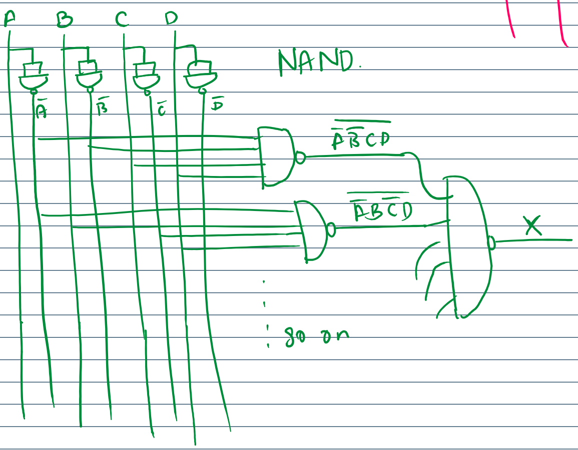
$X = \bar{A}\bar{B}CD + \bar{A}B\bar{C}D + \bar{A}BC\bar{D}$

$+ A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + AB\bar{C}\bar{D}$

AB \ CD	$\bar{C}\bar{D}$ 00	$\bar{C}D$ 01	CD 11	$C\bar{D}$ 10
$\bar{A}\bar{B}$ 00			1	
$\bar{A}B$ 01		1		1
AB 11	1			
$A\bar{B}$ 10		1		1



Y =

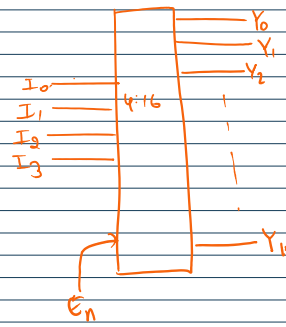


$X = \bar{A}\bar{B}CD + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + AB\bar{C}\bar{D}$

$= \bar{A}\bar{B}CD + \bar{A}B(C \oplus D) + A\bar{B}(C \oplus D) + AB\bar{C}\bar{D}$

$= \bar{A}\bar{B}CD + (C \oplus D)(A \oplus B) + AB\bar{C}\bar{D}$

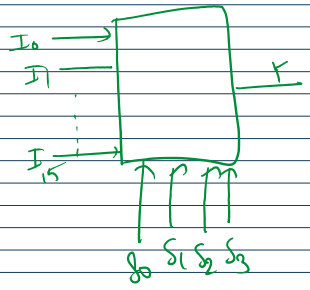
④ 4:16 decoder



E_n	I_0	I_1	I_2	I_3	Y_0	Y_1	Y_2	Y_3	...	Y_{15}
0	X	X	X	X	0	0	0	0	...	0
1	0	0	0	0	1	0	0	0	...	0
	0	0	0	1		1				
	0	0	1				1			
	0	0								
	0	1								

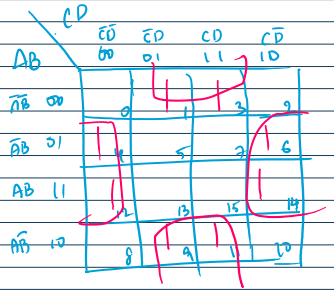
$Y_0 = \bar{I_0}\bar{I_1}\bar{I_2}\bar{I_3}\bar{E_n}$

16:1 MUX



S_0	S_1	S_2	S_3	Y
0	0	0	0	I_0
0	0	0	1	I_1
0	0	1	0	I_2
		1		
				I_{15}

⑤ $f(abcd) = \Sigma m(1346911121 14)$

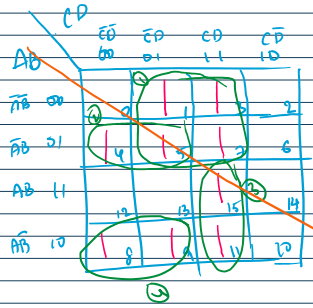


2 quad

→ $\bar{B}D + B\bar{D}$

$b \oplus D$

$f(abcd) = \Sigma m(1345789 11 15)$



① → $\bar{A}D$

② → $A\bar{B}\bar{C}$

③ → ACD

④ → $A\bar{B}\bar{C}$

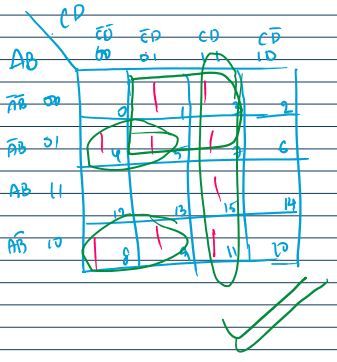
$\bar{A}D + A\bar{B}\bar{C} + ACD + A\bar{B}\bar{C}$

$\bar{A}D + ACD + A\bar{C}(B+\bar{B})$

$D(\bar{A}+AC) + \bar{A}\bar{C}$

$D(\bar{A}+C)$

$\bar{A}D + CD + \bar{A}\bar{C}$



$CD + \bar{A}D + \bar{A}B\bar{C} + A\bar{B}\bar{C}$

$CD + \bar{A}D + \bar{C}(A \oplus B)$

$ab'cd + bc'd'$

$f(a,b,c,d) = a'b'd + bcd + ab'd + bc'd'$