پاسخ تمرین سری دوم

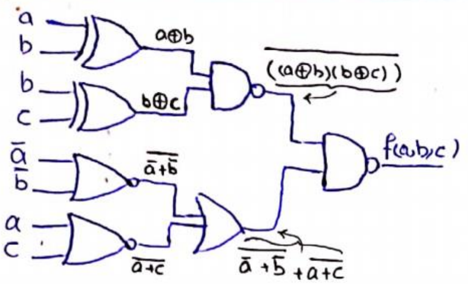
جواب سوال ۱

$$f(a,b,c,d)=\overline{(\bar a+c)}\cdot\overline{\left((\bar b+ad)\cdot(ac\bar d)\right)}=(a\bar c)\left((b\cdot(\bar a+\bar d))+(\bar a+\bar c+d)\right)$$

$$=(a\bar c)(\bar a b+b\bar d+\bar a+\bar c+d)=a\bar a b\bar c+ab\bar c\bar d+a\bar a\bar c+\underbrace{a\bar c\bar c}_{a\bar c}+a\bar c d=$$

$$ab\bar c\bar d+a\bar c+a\bar c d=a\bar c\,(\underbrace{b\bar d+1+d}_{1})=a\bar c$$

جواب سوال ۲



$$f(a,b,c)=\overline{\overline{((a\oplus b)(b\oplus c))}\cdot\overline{(\overline{\bar a+\bar b}+\overline{a+c})}}$$

$$=\overline{\overline{((a\oplus b)(b\oplus c))}}+\overline{\overline{(\overline{\bar a+\bar b}+\overline{a+c})}}=$$

$$[(a\oplus b)(b\oplus c)]+((\bar a+\bar b)\cdot(a+c))=$$

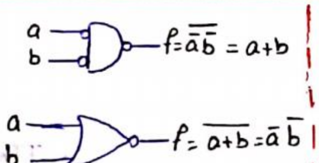
$$[(\bar a b+a\bar b)(\bar b c+b\bar c)]+((\bar a+\bar b)(a+c))$$ ضرب ها را انجام میدهیم

$$\bar a b\bar b c+\underbrace{\bar a b b\bar c}_{\bar a b\bar c}+\underbrace{a\bar b\bar b c}_{a\bar b c}+a\bar b b\bar c+a\bar a+\bar a c+a\bar b+\bar b c=\bar a b\bar c+a\bar b c+\bar a c+a\bar b+\bar b c=$$

$$\bar a(\underbrace{c+b\bar c}_{c+b})+a(\underbrace{\bar b c+\bar b}_{\bar b})+\bar b c=\bar a c+\bar a b+a\bar b+\bar b c=\bar a b+a\bar b+\bar a c$$

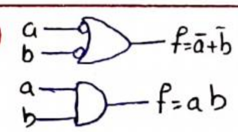
جواب سوال ۳

a)



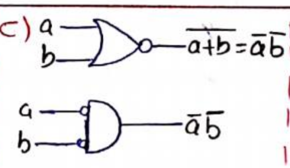
خروجی ها یکسان نیست

b)



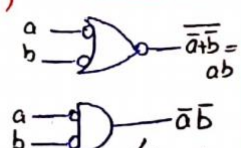
خروجی ها یکسان نیست

c)



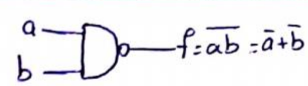
دارای خروجی یکسان است

d)

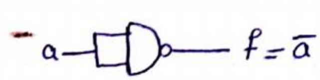


خروجی ها یکسان نیست

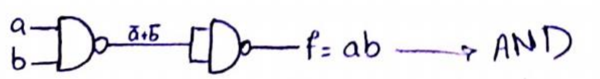
جواب سوال ۴



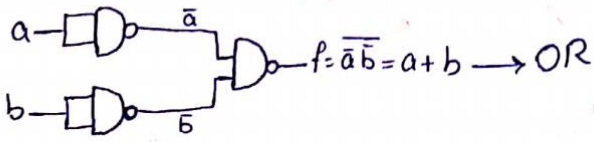
: گیت NAND



→ NOT



→ AND



→ OR

جواب سوال ۵

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

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

$\underbrace{ABC}_{111} + \underbrace{\bar{A}\bar{B}C}_{001} + \underbrace{\bar{A}B\bar{C}}_{010} + \underbrace{A\bar{B}\bar{C}}_{100}$ ← SOP

$\Rightarrow f(A,B,C) = \sum m(1,2,4,7) = \prod M(0,3,5,6) \Rightarrow f(A,B,C) = (A+B+C)(\bar{A}+\bar{B}+C)(\bar{A}+B+\bar{C})(A+\bar{B}+\bar{C})$ POS

$f(A,B,C) = \prod M(0,3,5,6) \Rightarrow \bar{f}(A,B,C) = \prod M(1,2,4,7)$

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

Inputs			outputs	
A	B	C	$f(A,B,C)$	
0	0	0	0	← M_0
0	0	1	1	← m_1
0	1	0	1	← m_2
0	1	1	0	← M_3
1	0	0	1	← m_4
1	0	1	0	← M_5
1	1	0	0	← M_6
1	1	1	1	← m_7

جواب سوال ۶

$f(a,b,c,d) = \bar{a}bd + \bar{d} + a\bar{b}\bar{c}\bar{d} + b\bar{d} + \bar{a}\bar{d}$

$\bar{a}bXd \rightarrow \begin{cases} \bar{a}b0d \rightarrow 0101 \rightarrow m_5 \\ \bar{a}b1d \rightarrow 0111 \rightarrow m_7 \end{cases}$

$XbX\bar{d} \rightarrow \begin{cases} 0b0\bar{d} \rightarrow 0100 \rightarrow m_4 \\ 0b1\bar{d} \rightarrow 0110 \rightarrow m_6 \\ 1b0\bar{d} \rightarrow 1100 \rightarrow m_{12} \\ 1b1\bar{d} \rightarrow 1110 \rightarrow m_{14} \end{cases}$

$XXX\bar{d} \rightarrow \begin{cases} 0000 \rightarrow m_0 \\ 0010 \rightarrow m_2 \\ 0100 \rightarrow m_4 \\ 0110 \rightarrow m_6 \\ 1000 \rightarrow m_8 \\ 1010 \rightarrow m_{10} \\ 1100 \rightarrow m_{12} \\ 1110 \rightarrow m_{14} \end{cases}$

$\bar{a}X\bar{X}\bar{d} \rightarrow \begin{cases} \bar{a}00\bar{d} \rightarrow 0000 \rightarrow m_0 \\ \bar{a}01\bar{d} \rightarrow 0010 \rightarrow m_2 \\ \bar{a}10\bar{d} \rightarrow 0100 \rightarrow m_4 \\ \bar{a}11\bar{d} \rightarrow 0110 \rightarrow m_6 \end{cases}$

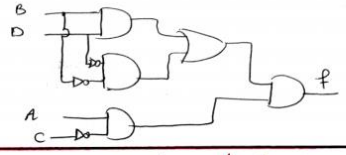
$a\bar{b}\bar{c}\bar{d} \rightarrow 1000 \rightarrow m_8$

$\Rightarrow f(a,b,c,d) = \sum m(0,2,4,5,6,8,10,12,14)$

$= \prod M(1,3,9,11,13,15)$

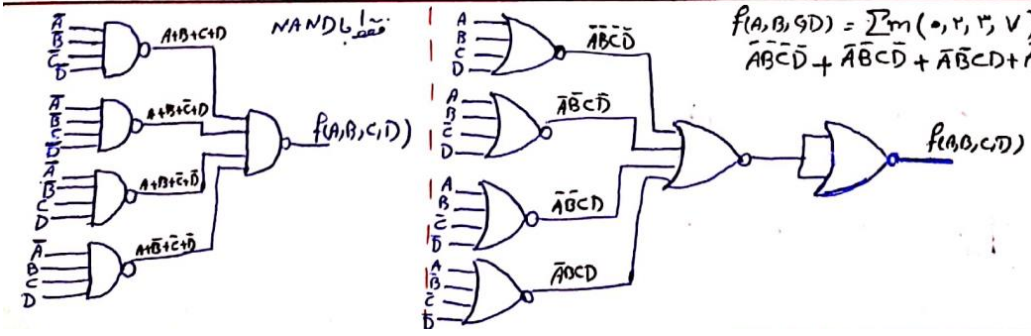
جواب سوال ۷

$f(A,B,C,D) = \sum m(8,13) = A\bar{B}\bar{C}\bar{D} + AB\bar{C}D = A\bar{C}(\bar{B}\bar{D} + BD)$



جواب سوال ۸

NAND6 فقط



$f(A,B,C,D) = \sum m(0,2,3,7) =$

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