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WE3.1

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 Calculator

Video explanation of solution is provided below the problem.

CMOS Functions

1/1 point (ungraded)
A single CMOS gate, consisting of an output node connected to a single pullup circuit containing zero or more PFETs and a single pulldown circuit containing zero or more NFETs, computes $F(A, B, C, D)$. It is observed that $F(1,0,1,1) = 1$. What can you say about the value of $F(1,0,0,0)$?

$F(1, 0, 0, 0) =$ ✓ Answer: 1

Explanation
We know that this CMOS gate outputs 1 when the second input is connected to a 0 and all other inputs are connected to 1s. 0 inputs dictate which PFETs are on and make the output 1, and 1 inputs dictate which NFETs are on and make the output 0. If we change some inputs from 1 to 0, we know that we are turning some NFETs off and some PFETs on. Since we already get 1 as an output with just the second input connected to 0, changing even more inputs to 0 can only mean that our output will remain a 1.

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Answers are displayed within the problem

CMOS Functions

Functions Implemented by CMOS Circuits

- CMOS gate has $F(1,0,\underline{1},1) = 1$
- What can you say about $F(1,0,\underline{0},0)$? $= 1$

Pullup PFETs

Pulldown NFETs

$F(A,B,C,D)$

$F(0,0,0,0) = 1$

$F(1,1,1,1) = 0$

▶ 1:46 / 1:46

▶ 1.0x

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Discussion

Topic: 3. CMOS / WE3.1

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Observation on CMOS circuits

If I did something "stupid" like build a circuit so the output $F(A,B,C,D)$ is equal to D , then $F(1,0,1,1) = 1$ and $F(1,0,0,0) = 0$. It seems there...

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