

Problem

Consider the three-place Boolean function f defined by the following rule: For each triple (x_1, x_2, x_3) of 0's and 1's,

$$f(x_1, x_2, x_3) = (4x_1 + 3x_2 + 2x_3) \bmod 2.$$

- Find $f(1, 1, 1)$ and $f(0, 0, 1)$.
- Describe f using an input/output table.

Step-by-step solution

Step 1 of 3

Consider the three-place Boolean function defined by the rule: for each triple (x_1, x_2, x_3) of 0's and 1's, $f(x_1, x_2, x_3) = (4x_1 + 3x_2 + 2x_3) \bmod 2$.

Step 2 of 3

(a)

Objective is to find $f(1,1,1)$ and $f(0,0,0)$.

For this consider,

$$\begin{aligned} f(1,1,1) &= (4 \times 1 + 3 \times 1 + 2 \times 1) \bmod 2 \\ &= 9 \bmod 2 \\ &= 1 \end{aligned}$$

And,

$$\begin{aligned} f(0,0,1) &= (4 \times 0 + 3 \times 0 + 2 \times 1) \bmod 2 \\ &= 2 \bmod 2 \\ &= 0 \end{aligned}$$

Thus,

$$\boxed{f(1,1,1) = 1}$$

And,

$$\boxed{f(0,0,0) = 0}$$

[Comments \(1\)](#)

Anonymous

It is f0,0,0. Not 0,0,1, but same answer regardless

Step 3 of 3

(b)

Next, objective is to describe f as an input/output table.

The input/output table for f is as follows:

Input			Output
x_1	x_2	x_3	$(4x_1 + 3x_2 + 2x_3) \bmod 2$
1	1	1	1
1	1	0	1
1	0	1	0
1	0	0	0
0	1	1	1
0	1	0	1
0	0	1	0
0	0	0	0