CISP 440

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Homework 17

# Section 9.1

1. y = (x1 v x2)

|  |  |  |
| --- | --- | --- |
| x1 | x2 | y = (x1 v x2) |
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 0 |

1. (x1 ^ !x2) v (x1 v !x3)

(1 ^ 0) v (1 v 1)

= 0 v 1 = **1**

1. x1 ^ !x2 v x3 is a Boolean expression

x1 is an expression & x2 & x3 is an expression by 9.1.2

x1 ^ x2 is an expression by 9.1.3d

x1 ^ x2 v x3 is an expression by 9.1.3c

!x2 is an expression by 9.1.3b

1. Create a circuit and logic table
   1. !x1 ^ !x2

x1

= y

x2

|  |  |  |
| --- | --- | --- |
| x1 | x2 | y = (!x1 ^ !x2) |
| 1 | 1 | 0 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 1 |

1. (x1 ^ !x2) v (x1 v !x3)

There is no combinatorial circuit for this expression because the truth value of x2 is irrelevant to the output of the expression.

|  |  |  |  |
| --- | --- | --- | --- |
| x1 | x2 | x3 | y = (x1 ^ !x2) v (x1 v !x3) |
| 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 |

# Section 9.2

1. S

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x1 | x2 | x3 | a = !(x1 v !x2) v (!x1 ^ x3) | b = !x1 ^ (x2 v x3) |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 |

1. x1 ^ !x2 = !(!x1 v x2)

x1 ^ !x2 = !(!x1) ^ !(x2) by 9.2.3

x1 ^ !x2 = x1 ^ !x2 by simplification, and is a true statement

# Section 9.3

1. for duals, 1 🡪 0, 0🡪1, +🡪\*, \*🡪+
2. (x + y)(x + 1) = x + xy + y

x\*y + x\*0 = x \* (x + y) \* y

xy + 0 = xy(x + y)

xy = xxy + xyy

xy = xy + xy

xy = xy

1. xy' = 0 iff xy = x

x + y’ = 1 iff x + y = x

x + y + y’ = 1

x + 1 = 1

1 = 1

# Section 9.4

1. f(x, y, z) = (x ^ !y ^ !z) v (!x ^ (y v z))

x

f(x, y, z)

y

z

1. f(w, x, y, z) = (!w ^ y ^ z) v (w ^ ((x ^ z) v !(x ^ y ^ z)))

w

x

f(w, x, y, z)

y

z

1. x \* y’ \* z’ + (x’ \* (y + z))

(x + y’ + z’) \* (x’ + y \* z)

(x + y’ + z’) \* (x’ + y)(x’ + z)

(x + y’ + z’) \* x’x’ + x’y + x’z + yz

(x + y’ + z’) \* x’ + x’y + x’z + yz

xx’ + xx’y + xx’z + xyz + x’y’ + x’yy’ + x’zy’ + yy’z + x’z’ + x’yz’ + x’zz’ + yzz’

0 + 0 + 0 + xyz + x’y’ + 0 + x’y’z + 0 + x’z’ + x’yz’ + 0 + 0

xyz + x’y’ + x’y’z + x’yz’ + x’z’

xyz + x’ + y’ + x’y’z + x’yz’ + x’ + z’

xyz + x’y’z’ + x’y’z + x’yz’

1 + x’y’z + x’yz’

1 + x’(y’z + yz’)

(!x ^ (y v z)) v (x ^ !y ^ !z)