Insert Name Here (change something, at least so it’s not identical)

CS 47

HW #2

1. Filler
2. Filler
3. 2’s Complement, 610 and -310:
   1. 610 = 01102

-310 = 11012

* 1. 00000110

x 11111101

00000000110

00000000000

00000011000

00000110000

00001100000

00011000000

00110000000

+ 01100000000

101111011102  (convert to only 8-bits) -> 111011102 = -1810

* 1. Extend to 8-Bit:
     1. Zero Extend:

610 → 000001102 → 610

-310 → 000011012 → 1310

* + 1. Signed Extend:

610 → 000001102 → 610

-310 → 111111012 → -310

1. Truth Tables:
   * 1. F(x, y, z) = (xy)' + z

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **X** | **Y** | **Z** | **XY** | **(XY)’** | **(XY)’+ Z** |
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 | 1 |

* 1. F(x, y, z) = (x'yz') + (xy'z)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X** | **Y** | **Z** | **X’** | **Y’** | **Z’** | **X’YZ’** | **XY’Z** | **F(X,Y,Z)** |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

1. Boolean Arithmatic Manipulation:
   1. x’y’z’ + xy’z’ + x’yz’ + xyz’ =

z’(x’y’ + xy’ + x’y + xy) =

z’((x + x’)y’ + (x + x’)y) =

z’((1)y’ + (1)y) =

z’(y’ + y) =

z’(1) = z’

* 1. (a’ + c)(a’ + d’)(b + c)(b + d’) =

(a’ + cd’)(b + cd’) =

a’b + cd’

1. Karnaugh Maps:
   1. f (A, B, C, D) = ∑ m (1, 2, 3, 4, 6, 7, 9, 11, 12, 13, 14, 15)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AB\CD** | **00** | **01** | **11** | **10** |
| **00** | 0 (0) | 1 (1) | 1 (3) | 1 (2) |
| **01** | 1 (4) | 0 (5) | 1 (7) | 1 (6) |
| **11** | 1 (C) | 1 (D) | 1 (E) | 1 (F) |
| **10** | 0 (8) | 1 (9) | 1 (B) | 0 (A) |

Prime Implicants: AD, BC, A’C, AB, CD, B’D, BD’

Essential Prime Implicants: BD’, B’D, A’C

SOP Expression: BD’ + B’D + A’C

* 1. f (w, x, y, z) = ∑ m (0, 5, 10, 15) + d(2, 7, 8, 13)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WX\YZ** | **00** | **01** | **11** | **10** |
| **00** | 1 (0) | 0 (1) | 0 (3) | X (2) |
| **01** | 0 (4) | 1 (5) | X (7) | 0 (6) |
| **11** | 0 (C) | X (D) | 1 (E) | 0 (F) |
| **10** | X (8) | 0 (9) | 0 (B) | 1 (A) |

Prime Implicants: XZ, X’Z’

Essential Prime Implicants: XZ, X’Z’

SOP Expression: XZ + X’Z’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | Is Single Digit |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AB\CD** | **00** | **01** | **11** | **10** |
| **00** | 1 (0) | 1 (1) | 1 (3) | 1 (2) |
| **01** | 1 (4) | 1 (5) | 1 (7) | 1 (6) |
| **11** | 0 (C) | 0 (D) | 0 (E) | 0 (F) |
| **10** | 1 (8) | 1 (9) | 0 (B) | 0 (A) |

Essential Prime Implicants: B’C’, A’

Expression: A’ + B’C’

Converting Expression:

* A’ + B’C’ (Initial Expression)
* A’ + (B + C)’ (De Morgan’s Law)
* (A(B+C))’ (De Morgan’s Law)
* (AB + AC)’ (Distributive)
* (AB)’(AC)’ (De Morgan’s Law)
* Different Notation: (A NAND B) AND (A NAND C)
* AND can be rewritten as two NANDs

