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***Homework 5***

**Problem 18:**

**Convert the following to the other canonical form:**

1. **F(x, y, z) = Σ(1, 3, 7)**

F(x, y, z) = Σ(1, 3, 7) = Π(0, 2, 4, 5, 6)

F(x, y, z) = (x+y+z).(x+y`+z).(x`+y+z).(x`+y+z`).(x`+y`+z)

1. **F(A, B, C, D) = Π(****0, 1, 2, 3, 4, 6, 12)**

F(A, B, C, D) = Π(0, 1, 2, 3, 4, 6, 12) = Σ(5, 7, 8, 9, 10, 11, 13, 14, 15)

F(A, B, C, D) = A`BC`D+A`BCD+AB`C`D`+AB`CD`+AB`CD+ABC`D+ABCD`+ABCD

**Problem 21:**

**Show that the dual of the XOR is equal to its complement.**

**Dual of XOR: (x+y`).(x`+y)**

**Complement of XOR (XNOR) = (x⊕y)`**

XOR: x⊕y = x`y + xy`

Dual of XOR: = (x+y`).(x`+y)

= xx` + xy + x`y` + yy`

= xy + x`y`

Complement of XOR (XNOR): = (x⊕y)`

= (xy`+x`y)`

= (x`+y).(x+y`)

= xx` + xy + x`y` + yy`

= xy + x`y`

**Problem 23:**

**Show that a positive logic NAND gate is a negative logic NOR gate and vice versa.**

Truth table for a NAND gate:

|  |  |  |
| --- | --- | --- |
| **x** | **y** | **z** |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Truth table for a positive logic NAND gate (L = 0, H = 1) with H and L:

|  |  |  |
| --- | --- | --- |
| **x** | **y** | **z** |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

Truth table for negative logic let L = 1, H = 0:

|  |  |  |
| --- | --- | --- |
| **x** | **y** | **z** |
| 1 | 1 | 0 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 1 |

The resulting truth table is that of the NOR gate using negative logic.