Assignment 3 – ECE 211 Chapter 3

1. Simplify the following Boolean function.
   1. F(w,x,y,z) = Σ(1,3,4,5,6,7,9,11,13,15)
   2. Z = B’C’D’ + BC’D + A’C’D + A’BCD + ACD’+A’B’CD’

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| yz  wx | 00 | 01 | 11 | 10 |  | CD  AB | 00 | 01 | 11 | 10 |
| 00 | 0 | 1 | 1 | 0 |  | 00 | 1 | 0 | 0 | 1 |
| 01 | 1 | 1 | 1 | 1 |  | 01 | 0 | 1 | 1 | 0 |
| 11 | 0 | 1 | 1 | 0 |  | 11 | 0 | 1 | 0 | 0 |
| 10 | 0 | 1 | 1 | 0 |  | 10 | 1 | 0 | 1 | 1 |

1. For the functions in 1, find the Product of Sum equations is simplest form.

a. F’ = z+w’x

b. Z’ = (B+D)(A+B’+D)(B’+C+D’)(A’BC’)

1. Simplify the following Boolean function
   1. F(A,B,C,D) = Π(1,3,6,9,11,12,14)
   2. Z=(A’ + B + D)(A’ + B’ + C’)(A’ + B’ + C)(B’ + C + D)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CD  AB | 00 | 01 | 11 | 10 |  | AB  CD | 00 | 01 | 11 | 10 |
| 00 | 1 | 0 | 0 | 1 |  | 00 | 1 | 0 | 0 | 0 |
| 01 | 1 | 1 | 1 | 0 |  | 01 | 1 | 1 | 0 | 0 |
| 11 | 1 | 0 | 0 | 1 |  | 11 | 1 | 1 | 0 | 0 |
| 10 | 1 | 0 | 0 | 1 |  | 10 | 1 | 1 | 0 | 0 |

1. Simplify the following Boolean function *F* with the don’t care conditions *d* and express in simplified sum of product form.
   1. F(w,x,y,z) = Σ(1,2,4,13)

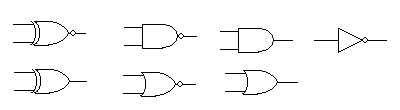
d(w,x,y,z) = Σ(0, 3,5,6,7,8,10)

* 1. F(A,B,C,D) = Σ(0,3,4,7,9,10,15)

d(A,B,C,D) = Σ(1,5,11)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CD  AB | 00 | 01 | 11 | 10 |  | CD  AB | 00 | 01 | 11 | 10 |
| 00 | x | 1 | X | 1 |  | 00 | 1 | X | 1 | 0 |
| 01 | 1 | x | x | X |  | 01 | 1 | x | 1 | 0 |
| 11 | 0 | 1 | 0 | x |  | 11 | 0 | 0 | 1 | 0 |
| 10 | 0 | 0 | 0 | 0 |  | 10 | 0 | 1 | X | 1 |

1. Draw the NAND only implementation for the expressions derived in 4a.
2. Draw the NOR only implementation for the expressions derived in 4a.
3. Implement the expression derived in 3a using
   1. AND-NOR
   2. NAND-AND
   3. OR-NAND
   4. NOR-OR
4. Derive a circuit for a 4-bit parity generator using odd parity.

These gates are here for your reference and to copy and paste if you want to draw the circuit on the computer.