Chapter 2 continued

* Ex Simplify
  + (x+y)(x+z) - Distribute
  + Xx + xz + xy + yz - idempotent
  + X + xz + x + yz – distributive
  + X (1 + y) + xz + yz – Dominant
  + X1 + xz + yz - Identity
  + X + xz + yz – distributive
  + X (1 + z) + yz – dominatiojn
  + X1 + yz – Identity
  + X + yz
* Ex: xy + z – Draw the logic diagram
  + XY are and gated together, then or'ed with Z
* EX: x'y + z
  + X is notted, then and'ed with y and then or'ed with Z
* EX: x'y'z + x'yz
  + X and y are notted then x'y' and z are and'ed together, x' is anded with yz. Then both gates are Or'ed together
* Simplify
  + 1) x'y + xy' + xy + x'y'
    - X'(y + y') + x(y' + y)
    - X'(1) + x(1)
    - X' + x
    - 1
  + 2) x' + xy + xz' + xy'z'
    - X' + xy + xz'(1 + y')
    - X' + xy + xz'
    - X' + x(y + z') - distributive
    - (x' + x) (x' + y + z')
    - 1 (x' + y + z')
* Find the Compliment
  + (Xy' + x'y)'
    - (Xy')' (x'y)'
    - (x' + y) (x + y')
    - X'x + x'y' + xy + yy'
    - X'y' + xy
* Pr. Using DeMorgans thm -> convert to only OR & compliment operations
  + F = x'y' + x'z + y'z
    - (x+y)' + (x+z')' + (y+z')'
* Pr. Using DeMorgans Thm => convert to only AND & compliments operations
  + F = x'y' + x'z + y'z
    - [(x'y')' (x'z)' (y'z)' ]'
* Canonical + Standard Forms
  + Canonical Forms are:
    - 1) sum of minterms ( or standard product (and))
    - 2) product of maxterms ( or standard sum ( or))
  + Standard Form are:
    - 1) sum of products (SOP) xy + xz
    - 2) product of sums (pos) (+)(+)

Canonical form Table

|  |  |  |
| --- | --- | --- |
| X y z | Minterms (term / Designation) | Maxterms (term/designation) |
| 000 | X'y'z' - m0 | X + y + z - M0 |
| 001 | X'y'z - m1 | X + y + z' - M1 |
| 010 | X'yz' - m2 | X + y' + z - M2 |
| 011 | X'yz - m3 | X + y' + z'- M3 |
| 100 | Xy'z' - m4 | X' + y + z - M4 |
| 101 | Xy'z - m5 | X' + y + z' - M5 |
| 110 | Xyz' - m6 | X' + y' + z - M6 |
| 111 | Xyz - m7 | X' + y' + z' -M7 |

* + (x'y'z')' = x + y + z
  + (m0)' = M(0)
  + (mi)' = Mi
  + (mi) = (Mi)'
* Ex: f(x(1)y(1)z(1) = xy' + x'z' -> Write F as sum of midterms

|  |  |  |
| --- | --- | --- |
| X y z | F | Minterms/Designations |
| 000 | 1 | X'y'z' - m0 |
| 001 | 0 | X'y'z - m1 |
| 010 | 1 | X'yz' -m2 |
| 011 | 0 | X'yz - m3 |
| 100 | 1 | Xy'z - m4 |
| 101 | 1 | Xy'z' -m5 |
| 110 | 0 | Xyz' - m6 |
| 111 | 0 | Xyz - m7 |

|  |  |
| --- | --- |
| F' | Max terms / Designation |
| 0 | X + y + z – M0 |
| 1 | X + y + z' - M1 |
| 0 | X + y' + z - M2 |
| 1 | X + y' + z' - M3 |
| 0 | X' + y + z - M4 |
| 0 | X' + y + z' - M5 |
| 1 | X' + y' + z – M6 |
| 1 | X ' + y' + z' - M7 |

* + F = x'y'z' + x'yz' + xy'z' + xy'z
    - M0 + m2 + m4 + m5
    - Or (sigma)(0,2,4,5)
  + F' = m1 + m3 + m6 + m7
    - F = (f')' = (m1 + m3 + m6 + m7)'
    - (m1)' m3' m6' m7'
    - M1 M3 M6 M7
    - (x+y+z')(x+y'+z') (x'+y'+z)(x'y'z')
    - (pi)(1,3,6,7)
* Sum of minterms
  + Ex: Express a fctn as sum of minterms algebratically
    - F = A + BC'
      * A(B+B') + (A+A')BC'
      * AB + AB' + ABC' A'BC'
      * AB(C+C') + AB'(C+C') + ABC' + A'BC'
      * ABC + ABC' + AB'C + AB'C' + ABC'+A'BC'
      * ABC + ABC' + AB'C + AB'C' + A'BC'
      * 111 + 110 + 101 + 100 + 010
      * (m7) + m6 + m5 + m4 + m2
      * (sigma) (2,4,5,6,7)
* Product of MaxTerms : Express fctn in product of Maxtmerms
  + F = A + BC'
    - (A+B) (A+C')
    - (A+B) + CC' = (A + B + C)(A + B + C')
    - A + C' + BB' = (A + B + C')(A + B' + C')
    - = (A + B + C)(A + B + C') (A + B + C') (A + B' + C')
    - = (A + B + C) (A + B + C') (A + B' + C')