# Guia 06

Arquitetura de Computadores-I
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OBS: os circuitos constam tanto aqui quanto anexados na forma (.circ)

01.)

a) f (x,y,z) = Σ m ( 3, 5, 7 ) = x'•y •z + x•y'•z + x•y•z

| m | x y z | minitermos | SoP( 3, 5, 7 ) |
|---|---|---|---|
| 0 | 000 | x'•y'•z' | 0 |
| 1 | 001 | x'•y'•z | 0 |
| 2 | 010 | x'•y •z' | 0 |
| 3 | 011 | x'•y •z = m3 | 1 |
| 4 | 100 | x•y'•z' | 0 |
| 5 | 101 | x•y'•z = m5 | 1 |
| 6 | 110 | x•y•z' | 0 |
| 7 | 111 | x•y•z=m7 | 1 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 |

SIMPLIFICANDO: x • z + y • z

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

b) f (x,y,z) = Σ m ( 2, 4, 6 ) = x'•y •z' + x•y'•z' + x•y•z'

| m | x y z | minitermos | SoP( 2, 4, 6 ) |
|---|---|---|---|
| 0 | 000 | x'•y'•z' | 0 |
| 1 | 001 | x'•y'•z | 0 |
| 2 | 010 | x'•y •z' = m2 | 1 |
| 3 | 011 | x'•y •z | 0 |
| 4 | 100 | x•y'•z' = m4 | 1 |
| 5 | 101 | x•y'•z | 0 |
| 6 | 110 | x•y•z' = m6 | 1 |
| 7 | 111 | x•y•z | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 |

SIMPLIFICANDO: y • z’ + x • z’

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

c) f (x,y,z) = Σ m ( 2, 4, 6, 7 ) = x'•y •z' + x•y'•z' + x•y•z' + x•y•z

| m | x y z | minitermos | SoP( 2, 4, 6, 7 ) |
|---|---|---|---|
| 0 | 000 | x'•y'•z' | 0 |
| 1 | 001 | x'•y'•z | 0 |
| 2 | 010 | x'•y •z' = m2 | 1 |
| 3 | 011 | x'•y •z | 0 |
| 4 | 100 | x•y'•z' = m4 | 1 |
| 5 | 101 | x•y'•z | 0 |
| 6 | 110 | x•y•z' = m6 | 1 |
| 7 | 111 | x•y•z = m7 | 1 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | | | | 1 |
| 1 | 1 | | 1 | 1 |

SIMPLIFICANDO: y • z’ + x • z’ + y • z

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

d) f (x,y,z) = Σ m ( 1, 2, 3, 5 ) = x'•y'•z + x'•y •z' + x'•y •z + x•y'•z

| m | x y z | minitermos | SoP( 1, 2, 3, 5 ) |
|---|---|---|---|
| 0 | 000 | x'•y'•z' | 0 |
| 1 | 001 | x'•y'•z = m1 | 1 |
| 2 | 010 | x'•y •z' = m2 | 1 |
| 3 | 011 | x'•y •z = m3 | 1 |
| 4 | 100 | x•y'•z' | 0 |
| 5 | 101 | x•y'•z = m5 | 1 |
| 6 | 110 | x•y•z' | 0 |
| 7 | 111 | x•y•z | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |

SIMPLIFICANDO: y • z + x • y

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 |

e) f (x,y,z) = Σ m ( 0, 2, 5, 7 ) = x'•y'•z' + x'•y •z' + x•y'•z + x•y•z

| m | x y z | minitermos | SoP( 0, 2, 5, 7 ) |
|---|---|---|---|
| 0 | 000 | x'•y'•z' = m0 | 1 |
| 1 | 001 | x'•y'•z | 0 |
| 2 | 010 | x'•y •z' = m2 | 1 |
| 3 | 011 | x'•y •z | 0 |
| 4 | 100 | x•y'•z' | 0 |
| 5 | 101 | x•y'•z m5 | 1 |
| 6 | 110 | x•y•z' | 0 |
| 7 | 111 | x•y•z = m7 | 1 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |

SIMPLIFICANDO: x • z + x' • z'

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

02.)
a) F (X,Y,Z) = π M ( 4, 5, 7 ) = (x'+y+z)  (x'+y+z')  (x'+y'+z')

| m | x y z | minitermos | PoS( 4, 5, 7 ) |
|---|---|---|---|
| 0 | 000 | x+y+z | 1 |
| 1 | 001 | x+y+z' | 1 |
| 2 | 010 | x+y'+z | 1 |
| 3 | 011 | x+y'+z' | 1 |
| 4 | 100 | x'+y+z = m4 | 0 |
| 5 | 101 | x'+y+z'  = m5 | 0 |
| 6 | 110 | x'+y'+z | 1 |
| 7 | 111 | x'+y'+z' = m7 | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |

SIMPLIFICANDO: ( x’ + z ) ( x’ + z’ )

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

b) F (X,Y,Z) = π M ( 1, 3, 7 ) = ( x'+y'+z' ) ( x+y+z' ) ( x+y'+z' )

| m | x y z | minitermos | PoS( 1, 3, 7 ) |
|---|---|---|---|
| 0 | 000 | x+y+z | 1 |
| 1 | 001 | x+y+z' =m1 | 0 |
| 2 | 010 | x+y'+z | 1 |
| 3 | 011 | x+y'+z' = m3 | 0 |
| 4 | 100 | x'+y+z | 1 |
| 5 | 101 | x'+y+z' | 1 |
| 6 | 110 | x'+y'+z | 1 |
| 7 | 111 | x'+y'+z' = m7 | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 |

SIMPLIFICANDO: ( x + z') ( y' + z' )

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

c) F (X,Y,Z) = π M ( 1, 2, 4, 5 ) = (x+y+z' ) ( x+y'+z ) ( x'+y+z ) ( x'+y+z' )

| m | x y z | minitermos | PoS( 1, 2, 4, 5 ) |
|---|---|---|---|
| 0 | 000 | x+y+z | 1 |
| 1 | 001 | x+y+z' = m1 | 0 |
| 2 | 010 | x+y'+z = m2 | 0 |
| 3 | 011 | x+y'+z' | 1 |
| 4 | 100 | x'+y+z = m4 | 0 |
| 5 | 101 | x'+y+z' = m5 | 0 |
| 6 | 110 | x'+y'+z | 1 |
| 7 | 111 | x'+y'+z' | 1 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 |

SIMPLIFICANDO: (x' + y)  ( y + z' ) ( x+y'+z )

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

d) F (X,Y,Z) = π M ( 0, 3, 6, 7 ) = ( x+y+z ) ( x+y'+z' ) ( x'+y'+z ) ( x'+y'+z' )

| m | x y z | minitermos | PoS( 0, 3, 6, 7 ) |
|---|---|---|---|
| 0 | 000 | x+y+z =m0 | 0 |
| 1 | 001 | x+y+z' | 1 |
| 2 | 010 | x+y'+z | 1 |
| 3 | 011 | x+y'+z' = m3 | 0 |
| 4 | 100 | x'+y+z | 1 |
| 5 | 101 | x'+y+z' | 1 |
| 6 | 110 | x'+y'+z = m6 | 0 |
| 7 | 111 | x'+y'+z' = m7 | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 |

SIMPLIFICANDO: ( x + y + z ) ( y’ + z’ ) ( x’ + y’ )

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 |

e) F (X,Y,Z) = π M ( 1, 2, 5, 7 ) = ( x+y+z' ) ( x+y'+z ) ( x'+y+z' ) ( x'+y'+z' )
( x+y+~z ) ( x+~y+z ) ( ~x+y+~z ) ( ~x+ ~y+ ~z )

| m | x y z | minitermos | PoS( 1, 2, 5, 7 ) |
|---|---|---|---|
| 0 | 000 | x+y+z | 1 |
| 1 | 001 | x+y+z' = m1 | 0 |
| 2 | 010 | x+y'+z = m2 | 0 |
| 3 | 011 | x+y'+z' | 1 |
| 4 | 100 | x'+y+z | 1 |
| 5 | 101 | x'+y+z' = m5 | 0 |
| 6 | 110 | x'+y'+z | 1 |
| 7 | 111 | x'+y'+z' = m7 | 0 |

| X \ YZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |

SIMPLIFICANDO: ( x+y+z' ) ( x+y'+z ) ( x'+y+z ) ( x'+y'+z' )

TABELA VERDADE LOGISIM:

| x | y | z | s |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

03.)
a) f (x,y,w,z) = Σ m ( 1, 3, 6, 7, 10, 11 ) = x'•y'•w'•z + x'•y'•w •z + x'•y•w•z + x'•y•w•z + x•y'•w•z + x•y'•w•z

| m | x y w z | minitermos | SoP ( 1, 3, 6, 7, 10, 11 ) |
|---|---|---|---|
| 0 | 0000 | x'•y'•w'•z' | 0 |
| 1 | 0001 | x'•y'•w'•z = m1 | 1 |
| 2 | 0010 | x'•y'•w •z' | 0 |
| 3 | 0011 | x'•y'•w •z = m3 | 1 |
| 4 | 0100 | x'•y•w'•z' | 0 |
| 5 | 0101 | x'•y•w'•z | 0 |
| 6 | 0110 | x'•y•w•z '= m6 | 1 |
| 7 | 0111 | x'•y•w•z = m7 | 1 |
| 8 | 1000 | x•y'•w'•z' | 0 |
| 9 | 1001 | x•y'•w'•z | 0 |
| 10 | 1010 | x•y'•w•z' | 0 |
| 11 | 1011 | x•y'•w•z = m11 | 1 |
| 12 | 1100 | x•y•w'•z' | 0 |
| 13 | 1101 | x•y•w'•z | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 1 | 0 |
| 01 | 0 | 0 | 1 | 1 |
| 11 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 1 | 0 |

SIMPLIFICANDO: ~x y w z + x ~y z

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 |

b) f (x,y,w,z) = Σ m ( 0, 2, 3, 5, 8, 9, 12 ) = x'•y'•w'•z' + x'•y'•w •z' + x'•y'•w •z+ + x'•y•w'•z + x•y'•w'•z' + x•y'•w'•z + x•y•w'•z'

| m | x y w z | minitermos | SoP ( 0, 2, 3, 5, 8, 9, 12 ) |
|---|---|---|---|
| 0 | 0000 | x'•y'•w'•z' m = 0 | 1 |
| 1 | 0001 | x'•y'•w'•z | 0 |
| 2 | 0010 | x'•y'•w •z' m=2 | 1 |
| 3 | 0011 | x'•y'•w •z = m3 | 1 |
| 4 | 0100 | x'•y•w'•z' | 0 |
| 5 | 0101 | x'•y•w'•z =m5 | 1 |
| 6 | 0110 | x'•y•w•z' | 0 |
| 7 | 0111 | x'•y•w•z | 0 |
| 8 | 1000 | x•y'•w'•z' = m8 | 1 |
| 9 | 1001 | x•y'•w'•z = m9 | 1 |
| 10 | 1010 | x•y'•w•z' | 0 |
| 11 | 1011 | x•y'•w•z | 0 |
| 12 | 1100 | x•y•w'•z' = m12 | 1 |
| 13 | 1101 | x•y•w'•z | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 0 | 1 | 1 |
| 01 | 0 | 1 | 0 | 0 |
| 11 | 1 | 0 | 0 | 0 |
| 10 | 0 | 1 | 0 | 0 |

SIMPLIFICANDO: ~x ~y ~z + ~x ~y w + ~x y ~w z + x ~y ~w z + x y ~w ~z

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 |

c) f (x,y,w,z) = Σ m ( 0, 1, 2, 4, 6, 8, 11, 15 ) = x'•y'•w'•z + x'•y'•w •z'  + x'•y•w'•z + x'•y•w•z' + x•y'•w'•z'+ x•y'•w•z  + x•y•w•z

| m | x y w z | minitermos | SoP (0, 1, 2, 4, 6, 8, 11, 15 ) |
|---|---|---|---|
| 0 | 0000 | x'•y'•w'•z' | 0 |
| 1 | 0001 | x'•y'•w'•z = m1 | 1 |
| 2 | 0010 | x'•y'•w •z' =m2 | 1 |
| 3 | 0011 | x'•y'•w •z | 0 |
| 4 | 0100 | x'•y•w'•z' =m4 | 1 |
| 5 | 0101 | x'•y•w'•z | 0 |
| 6 | 0110 | x'•y•w•z' = m6 | 0 |
| 7 | 0111 | x'•y•w•z | 0 |
| 8 | 1000 | x•y'•w'•z' = m8 | 1 |
| 9 | 1001 | x•y'•w'•z | 0 |
| 10 | 1010 | x•y'•w•z' | 0 |
| 11 | 1011 | x•y'•w•z = m11 | 1 |
| 12 | 1100 | x•y•w'•z' | 0 |
| 13 | 1101 | x•y•w'•z | 0 |
| 14 | 1110 | x •y• w •z' | 0 |
| 15 | 1111 | x•y•w•z = m15 | 1 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 |  | 1 |  | 1 |
| 01 | 1 |  |  | 1 |
| 11 |  |  | 1 |  |
| 10 | 1 |  | 1 |  |

SIMPLIFICANDO: ~x ~w z + ~x w ~z + x ~y ~w ~z + x w z

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

d) f (x,y,w,z) = Σ m ( 2, 4, 5, 7, 10, 11, 14 ) = x'•y'•w •z' + x'•y•w'•z  + x'•y•w'•z + x'•y•w•z  + x•y'•w•z' + x•y'•w•z +x •y• w •z'

| m | x y w z | minitermos | SoP (2, 4, 5, 7, 10, 11, 14 ) |
|---|---|---|---|
| 0 | 0000 | x'•y'•w'•z' | 0 |
| 1 | 0001 | x'•y'•w'•z | 0 |
| 2 | 0010 | x'•y'•w •z' =m2 | 1 |
| 3 | 0011 | x'•y'•w •z | 0 |
| 4 | 0100 | x'•y•w'•z' =m4 | 1 |
| 5 | 0101 | x'•y•w'•z =m5 | 1 |
| 6 | 0110 | x'•y•w•z' | 0 |
| 7 | 0111 | x'•y•w•z =m7 | 1 |
| 8 | 1000 | x•y'•w'•z' | 0 |
| 9 | 1001 | x•y'•w'•z | 0 |
| 10 | 1010 | x•y'•w•z' =m10 | 1 |
| 11 | 1011 | x•y'•w•z = m11 | 1 |
| 12 | 1100 | x•y•w'•z' | 0 |
| 13 | 1101 | x•y•w'•z | 0 |
| 14 | 1110 | x •y• w •z' = m14 | 1 |
| 15 | 1111 | x•y•w•z | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 0 | 0 | 0 | 1 |
| 01 | 0 | 1 | 1 | 0 |
| 11 | 0 | 0 | 0 | 1 |
| 10 | 0 | 0 | 1 | 1 |

SIMPLIFICANDO: ~y w ~z + ~x y z + x ~y w + x w ~z

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

e) f (x,y,w,z) = Σ m ( 0, 1, 2, 6, 8, 9, 14, 15 ) = x'•y'•w'•z' + x'•y'•w'•z +x'•y'•w •z'  + x'•y•w•z + x•y'•w'•z' + x •y• w •z' +x•y•w•z

| m | x y w z | minitermos | SoP (0, 1, 2, 6, 8, 9, 14, 15 ) |
|---|---|---|---|
| 0 | 0000 | x'•y'•w'•z' =m0 | 1 |
| 1 | 0001 | x'•y'•w'•z = m1 | 1 |
| 2 | 0010 | x'•y'•w •z' =m2 | 1 |
| 3 | 0011 | x'•y'•w •z | 0 |
| 4 | 0100 | x'•y•w'•z' | 1 |
| 5 | 0101 | x'•y•w'•z | 0 |
| 6 | 0110 | x'•y•w•z' = m6 | 1 |
| 7 | 0111 | x'•y•w•z | 0 |
| 8 | 1000 | x•y'•w'•z' = m8 | 1 |
| 9 | 1001 | x•y'•w'•z | 0 |
| 10 | 1010 | x•y'•w•z' | 0 |
| 11 | 1011 | x•y'•w•z | 0 |
| 12 | 1100 | x•y•w'•z' | 0 |
| 13 | 1101 | x•y•w'•z | 0 |
| 14 | 1110 | x •y• w •z' = m14 | 1 |
| 15 | 1111 | x•y•w•z = m15 | 1 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 0 | 1 |
| 01 | 0 | 0 | 1 | 0 |
| 11 | 0 | 0 | 1 | 1 |
| 10 | 1 | 0 | 0 | 1 |

SIMPLIFICANDO: ~x ~y ~w + ~x ~y ~z + ~y ~w ~z + y w z + x y w

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

04.)
a) F (X,Y,W,Z) = π M ( 2, 6, 7, 14 ) = (x+y+w'+z) (x+y'+w'+z) (x+y'+w'+z') (x'+y'+w'+z)

| m | x y w z | minitermos | PoS ( 2, 6, 7, 14 ) |
|---|---|---|---|
| 0 | 0000 | x+y+w+z | 1 |
| 1 | 0001 | x+y+w+z' | 1 |
| 2 | 0010 | x+y+w'+z = m2 | 0 |
| 3 | 0011 | x+y+w'+z' | 1 |
| 4 | 0100 | x+y'+w+z | 1 |
| 5 | 0101 | x+y'+w+z' | 1 |
| 6 | 0110 | x+y'+w'+z = m6 | 0 |
| 7 | 0111 | x+y'+w'+z' = m7 | 0 |
| 8 | 1000 | x'+y+w+z | 1 |
| 9 | 1001 | x'+y+w+z' | 1 |
| 10 | 1010 | x'+y+w'+z | 1 |
| 11 | 1011 | x'+y+w'+z' | 1 |
| 12 | 1100 | x'+y'+w+z | 1 |
| 13 | 1101 | x'+y'+w+z' | 1 |
| 14 | 1110 | x'+y'+w'+z = m14 | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 1 | 0 |
| 01 | 1 | 1 | 0 | 0 |
| 11 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 1 | 1 |

SIMPLIFICANDO: (x + ~w + z) (x + ~y + ~w) (~y + ~w + z)

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

b) F (X,Y,W,Z) = π M ( 4, 8, 9, 10, 12 ) = (x+y'+w+z)  (x'+y+w+z)  (x'+y+w+z')  (x'+y+w'+z)  (x'+y'+w+z)

| m | x y w z | minitermos | PoS ( 4, 8, 9, 10, 12 ) |
|---|---|---|---|
| 0 | 0000 | x+y+w+z | 1 |
| 1 | 0001 | x+y+w+z' | 1 |
| 2 | 0010 | x+y+w'+z | 1 |
| 3 | 0011 | x+y+w'+z' | 1 |
| 4 | 0100 | x+y'+w+z = m4 | 0 |
| 5 | 0101 | x+y'+w+z' | 1 |
| 6 | 0110 | x+y'+w'+z | 1 |
| 7 | 0111 | x+y'+w'+z' | 1 |
| 8 | 1000 | x'+y+w+z =m8 | 0 |
| 9 | 1001 | x'+y+w+z' =m9 | 0 |
| 10 | 1010 | x'+y+w'+z =m10 | 0 |
| 11 | 1011 | x'+y+w'+z' | 1 |
| 12 | 1100 | x'+y'+w+z = m12 | 0 |
| 13 | 1101 | x'+y'+w+z' | 1 |
| 14 | 1110 | x'+y'+w'+z | 1 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 1 | 1 |
| 01 | 0 | 1 | 1 | 1 |
| 11 | 0 | 1 | 1 | 1 |
| 10 | 0 | 0 | 1 | 0 |

SIMPLIFICANDO: (~y + w + z) (~x + y + w) (~x + y + z)

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

c) F (X,Y,W,Z) = π M ( 4, 8, 11, 12, 15 ) = (x+y'+w+z)  (x'+y+w+z) (x'+y+w'+z') (x'+y'+w+z ) (x'+y'+w'+z')

| m | x y w z | minitermos | PoS ( 4, 8, 11, 12, 15 ) |
|---|---|---|---|
| 0 | 0000 | x+y+w+z | 1 |
| 1 | 0001 | x+y+w+z' | 1 |
| 2 | 0010 | x+y+w'+z | 1 |
| 3 | 0011 | x+y+w'+z' | 1 |
| 4 | 0100 | x+y'+w+z = m4 | 0 |
| 5 | 0101 | x+y'+w+z' | 1 |
| 6 | 0110 | x+y'+w'+z | 1 |
| 7 | 0111 | x+y'+w'+z' | 1 |
| 8 | 1000 | x'+y+w+z =m8 | 0 |
| 9 | 1001 | x'+y+w+z' | 1 |
| 10 | 1010 | x'+y+w'+z | 1 |
| 11 | 1011 | x'+y+w'+z' = m11 | 0 |
| 12 | 1100 | x'+y'+w+z = m12 | 0 |
| 13 | 1101 | x'+y'+w+z' | 1 |
| 14 | 1110 | x'+y'+w'+z | 1 |
| 15 | 1111 | x'+y'+w'+z' = m15 | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 1 | 1 |
| 01 | 0 | 1 | 1 | 1 |
| 11 | 0 | 1 | 0 | 1 |
| 10 | 0 | 1 | 0 | 1 |

SIMPLIFICANDO:  (~y + w + z) (~x + w + z) (~x + ~w + ~z)

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

d) F (X,Y,W,Z) = π M ( 1, 3, 6, 8, 13, 15 ) = (x+y+w+z') (x+y+w'+z') (x+y'+w'+z ) (x'+y+w+z) (x'+y'+w+z') (x'+y'+w'+z' )

| m | x y w z | minitermos | PoS ( 1, 3, 6, 8, 13, 15 ) |
|---|---|---|---|
| 0 | 0000 | x+y+w+z | 1 |
| 1 | 0001 | x+y+w+z' = m1 | 0 |
| 2 | 0010 | x+y+w'+z | 1 |
| 3 | 0011 | x+y+w'+z' = m3 | 0 |
| 4 | 0100 | x+y'+w+z | 1 |
| 5 | 0101 | x+y'+w+z' | 1 |
| 6 | 0110 | x+y'+w'+z  = m6 | 0 |
| 7 | 0111 | x+y'+w'+z' | 1 |
| 8 | 1000 | x'+y+w+z = m8 | 0 |
| 9 | 1001 | x'+y+w+z' | 1 |
| 10 | 1010 | x'+y+w'+z | 1 |
| 11 | 1011 | x'+y+w'+z' | 1 |
| 12 | 1100 | x'+y'+w+z | 1 |
| 13 | 1101 | x'+y'+w+z' = m13 | 0 |
| 14 | 1110 | x'+y'+w'+z | 1 |
| 15 | 1111 | x'+y'+w'+z' = m15 | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 0 | 0 | 1 |
| 01 | 1 | 1 | 1 | 0 |
| 11 | 1 | 0 | 0 | 1 |
| 10 | 0 | 1 | 1 | 1 |

SIMPLIFICANDO: (x + y + ~z) (x + ~y + ~w + z) (~x + y + w + z) (~x + ~y + ~z)

TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 |

e) F (X,Y,W,Z) = π M ( 4, 5, 6, 7, 14, 15 ) = (x+y'+w+z) (x+y'+w+z' ) (x+y'+w'+z ) (x+y'+w'+z' ) (x'+y'+w'+z) (x'+y'+w'+z')

| m | x y w z | minitermos | PoS ( 4, 5, 6, 7, 14, 15 ) |
|---|---|---|---|
| 0 | 0000 | x+y+w+z | 1 |
| 1 | 0001 | x+y+w+z' | 1 |
| 2 | 0010 | x+y+w'+z | 1 |
| 3 | 0011 | x+y+w'+z' | 1 |
| 4 | 0100 | x+y'+w+z = m4 | 0 |
| 5 | 0101 | x+y'+w+z' = m5 | 0 |
| 6 | 0110 | x+y'+w'+z  = m6 | 0 |
| 7 | 0111 | x+y'+w'+z' = m7 | 0 |
| 8 | 1000 | x'+y+w+z | 1 |
| 9 | 1001 | x'+y+w+z' | 1 |
| 10 | 1010 | x'+y+w'+z | 1 |
| 11 | 1011 | x'+y+w'+z' | 1 |
| 12 | 1100 | x'+y'+w+z | 1 |
| 13 | 1101 | x'+y'+w+z' | 1 |
| 14 | 1110 | x'+y'+w'+z =m14 | 0 |
| 15 | 1111 | x'+y'+w'+z' = m15 | 0 |

| X Y\ WZ | 00 | 0 1 | 1 1 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 1 | 1 |
| 01 | 0 | 0 | 0 | 0 |
| 11 | 1 | 1 | 0 | 0 |
| 10 | 1 | 1 | 1 | 1 |

SIMPLIFICANDO: (x + ~y) (~y + ~w)

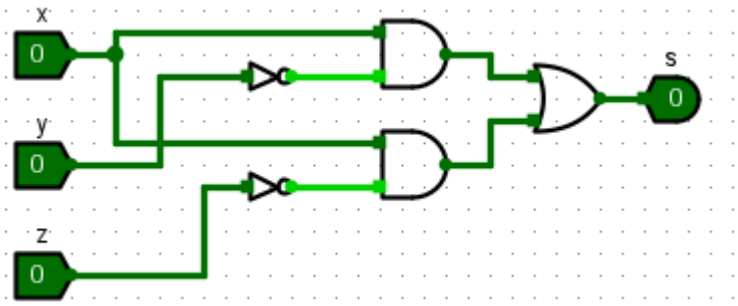
TABELA VERDADE LOGISIM:

| x | y | w | z | s |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 |

05.)
EXPRESSÃO ORIGINAL: (~( ~x | ~y ) & ~( x & y ) ) | ~(( z & y ) | ~x)

EXPRESSÃO SIMPLIFICADA: x ~y + x ~z

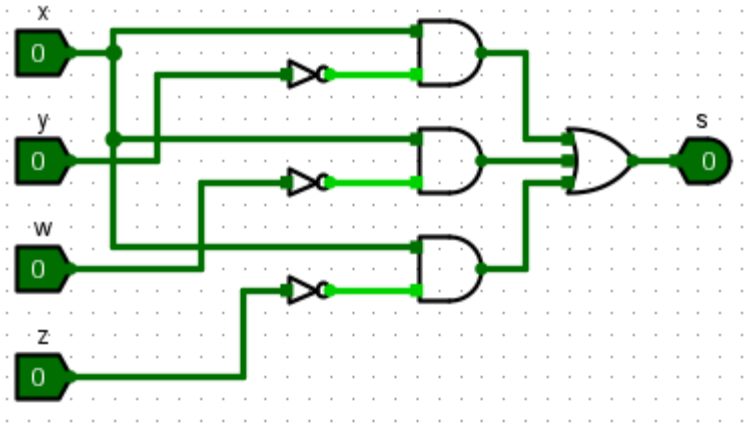
PROGRAMA SIMPLIFICADO:




06.)
EXPRESSÃO ORIGINAL: (~( ~y | ~x | w ) & (~ (x & y & ~w) ) )  |  (~( ( y & w & z) | ~x) )

EXPRESSÃO SIMPLIFICADA: x ~y + x ~w + x ~z

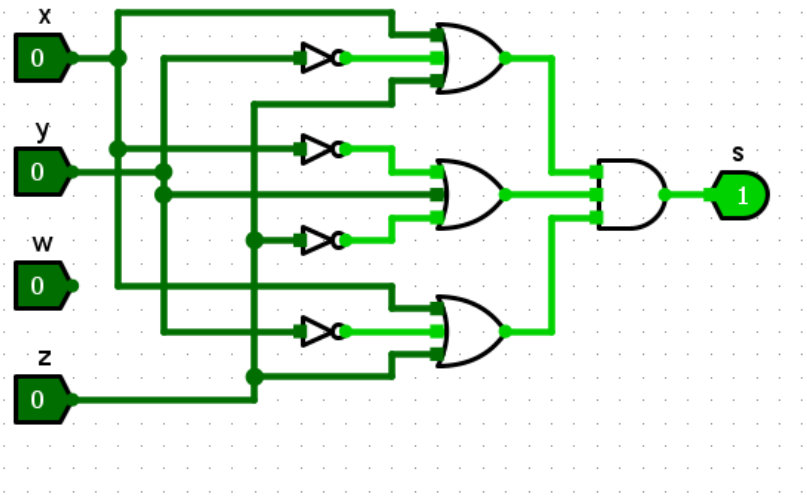
PROGRAMA SIMPLIFICADO:



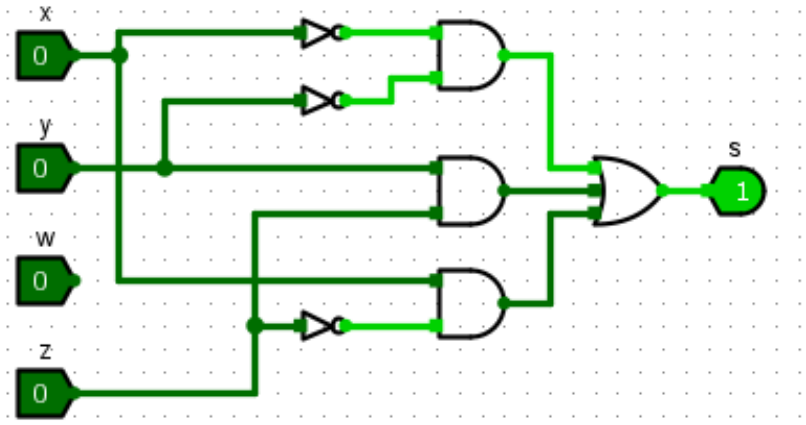
07.)
EXPRESSÃO ORIGINAL: ( x | ~y | z ) & (~x | y | ~z) & ( x | ~y | z );

EXPRESSÃO SIMPLIFICADA: x ~y + x ~w + x ~z

PROGRAMA ORIGINAL: 7.circ



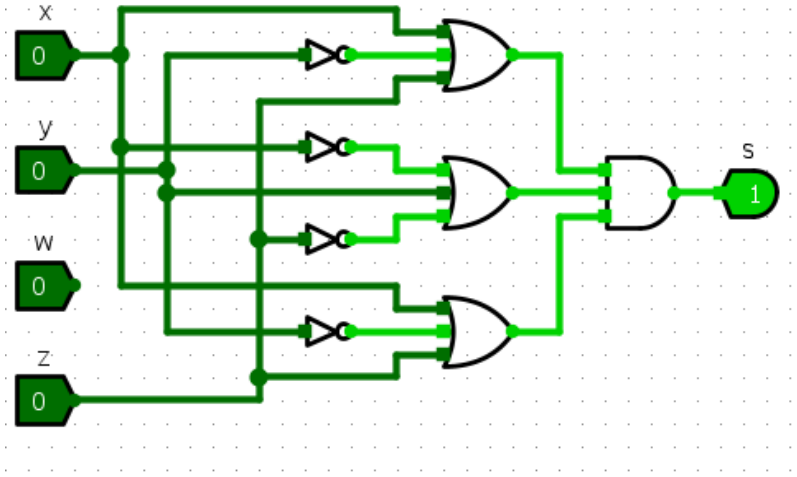

PROGRAMA SIMPLIFICADO: 7_1.circ



08.)
EXPRESSÃO ORIGINAL: (w & x & ~y & z) | (w & ~x & y & ~z) | (w & x & ~y & ~z) | (~w & ~x & y & ~z);

EXPRESSÃO SIMPLIFICADA: ~x ~y + y z + x ~z

PROGRAMA ORIGINAL: (8.circ)




PROGRAMA SIMPLIFICADO: (8_1.circ)