Universidade de Brasília

Circuitos Digitais – Prof. Marcelo Grandi Mandelli

Lista de Exercícios 5 – Multiplexadores

1. Projete o circuito das funções booleanas abaixo utilizando um MUX 4:1 e algumas portas lógicas adicionais. Utilize A e B nas entradas de seleção do MUX.

   a) $F(A,B,C) = \sum m(0,4,6,7)$

   b) $F(A,B,C) = \sum m(1,2,3,5,6)$

   c) $F(A,B,C) = \sum m(2,4,5,6,7)$

   d) $F(A,B,C) = \sum m(0,3,7) + \sum d(1,2)$

   e) $F(A,B,C) = \overline{A}\,\overline{B}C + A\,\overline{B}C + AC$

   f) $F(A,B,C,D) = \sum m(3,4,9,12,15)$

   g) $F(A,B,C,D) = \sum m(0,2,3,4,7,8,12,13)$

   h) $F(A,B,C,D) = \sum m(2,3,6,11,13)$

   i) $F(A,B,C,D) = \sum m(0,1,5,8,11) + \sum d(10,15)$

   j) $F(A,B,C,D) = A\,\overline{B}CD + A\,\overline{B}\,\overline{C}D + \overline{A}\,BC\overline{D} + \overline{A}\,BCD + \overline{A}\,\overline{B}C + AB$

   k) $F(A,B,C,D,E) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}\,C\,\overline{D}E + \overline{A}\,BC + A\overline{B}C\overline{D} + ABCD\overline{E}$

2. Projete o circuito das funções booleanas abaixo utilizando um MUX 8:1 e algumas portas lógicas adicionais. Utilize A, B e C nas entradas de seleção do MUX.

   a) $F(A,B,C) = \sum m(2,4,5,6,7)$

   b) $F(A,B,C) = \sum m(0,3,7) + \sum d(1,2)$

   c) $F(A,B,C,D) = \sum m(0,2,3,4,7,8,12,13)$

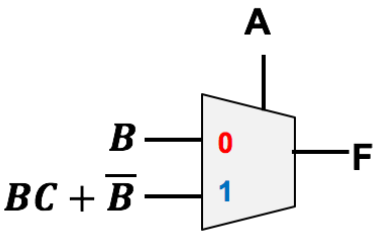
   d) $F(A,B,C,D) = \sum m(2,3,6,11,13)$

   e) $F(A,B,C,D) = A\,\overline{B}CD + A\,\overline{B}\,\overline{C}D + \overline{A}\,BC\overline{D} + \overline{A}\,BCD + \overline{A}\,\overline{B}C + AB$

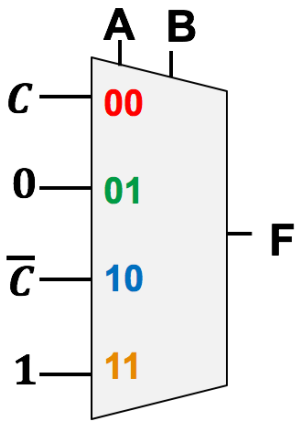
   f) $F(A,B,C,D,E) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}\,C\,\overline{D}E + \overline{A}\,BC + A\overline{B}C\overline{D} + ABCD\overline{E}$

3. Diga qual é a função booleana implementada por cada multiplexador abaixo.

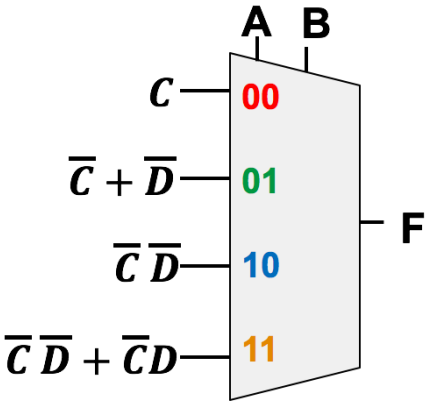
a)



b)



c)



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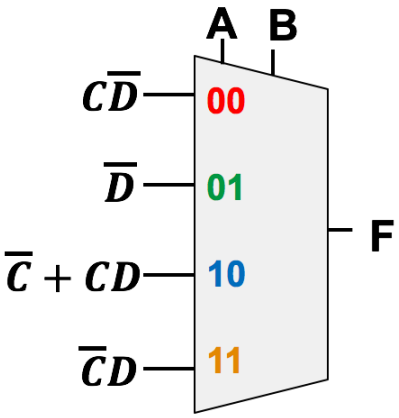
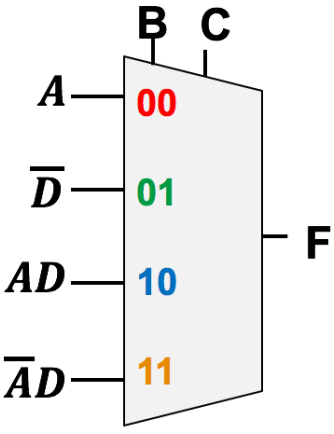
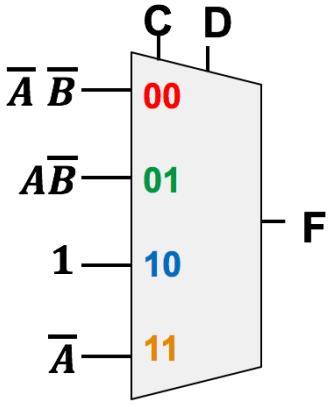


e)



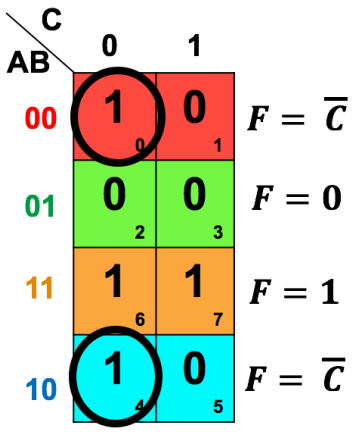
f)

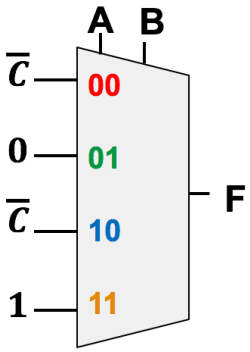


GABARITO

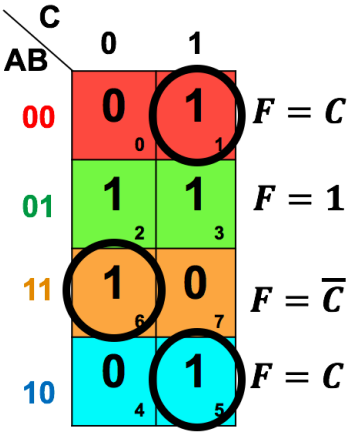
1.

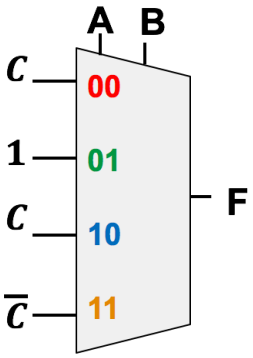
a) $F(A,B,C) = \sum m(0,4,6,7)$



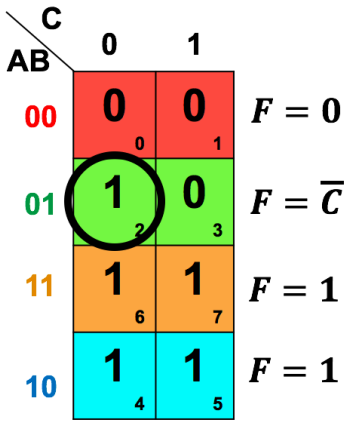


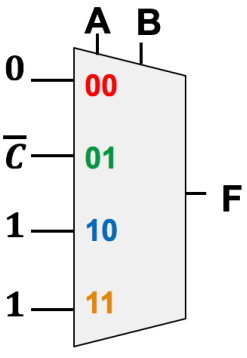
b) $F(A,B,C) = \sum m(1,2,3,5,6)$





c) $F(A,B,C) = \sum m(2,4,5,6,7)$

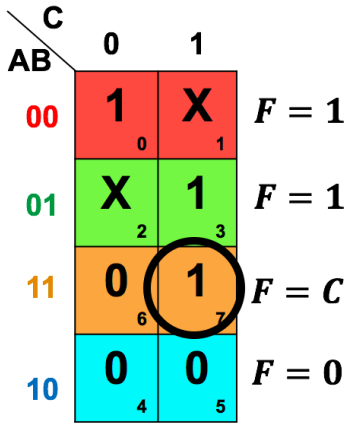


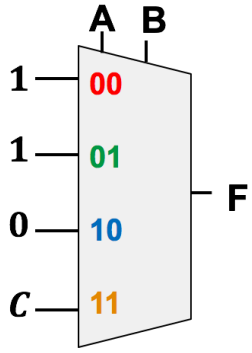


d) $F(A,B,C) = \sum m(0,3,7) + \sum d(1,2)$

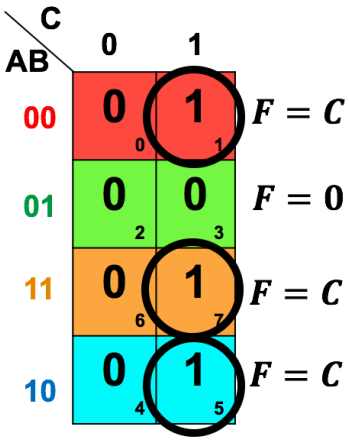
Nas funções booleanas contendo *don`t cares (X)*, você pode decidir se considera o X como 1 ou 0.

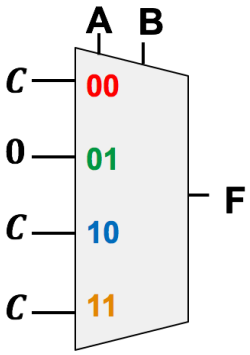
Dessa forma, essas questões tem múltiplas respostas.



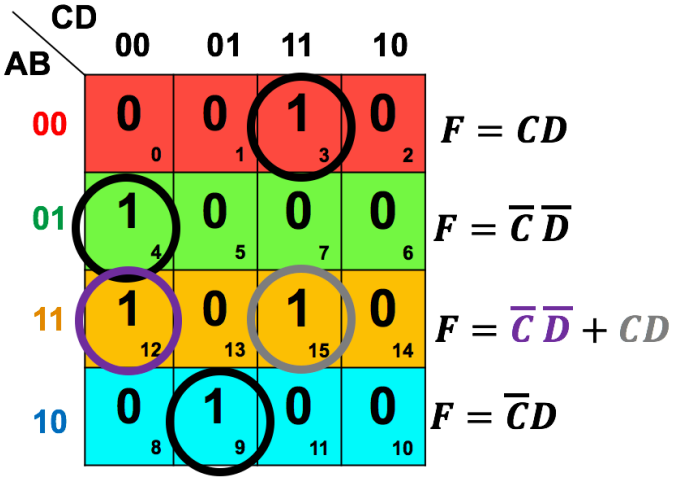


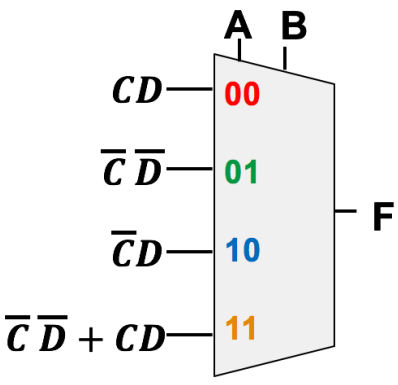
e) $F(A,B,C) = \overline{A}\,\overline{B}C + A\,\overline{B}C + AC$



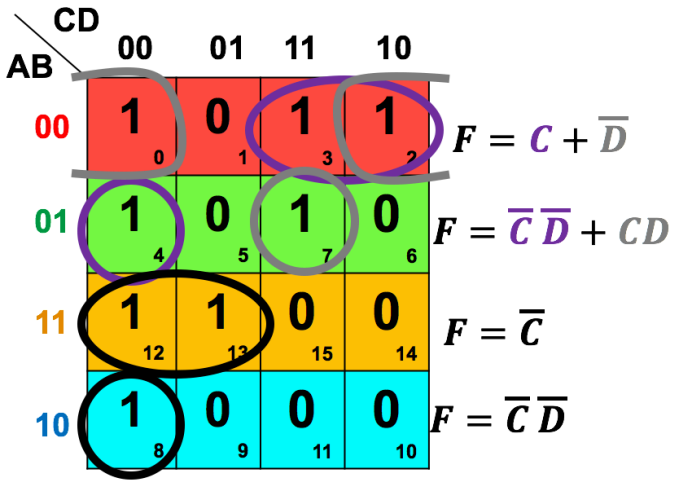


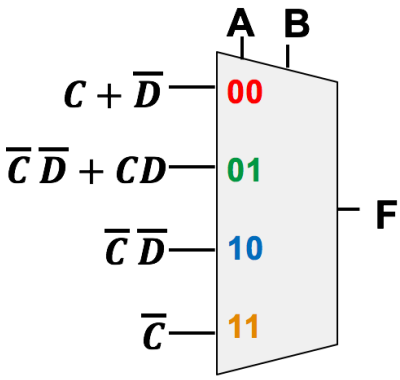
f) $F(A,B,C,D) = \sum m(3,4,9,12,15)$



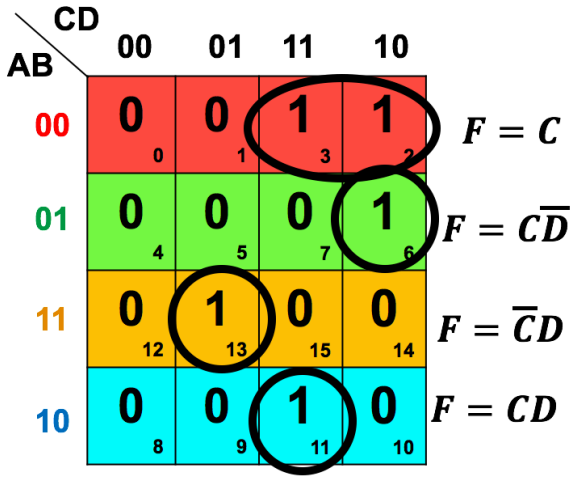


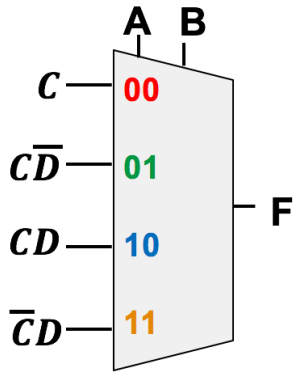
g) $F(A,B,C,D) = \sum m(0,2,3,4,7,8,12,13)$



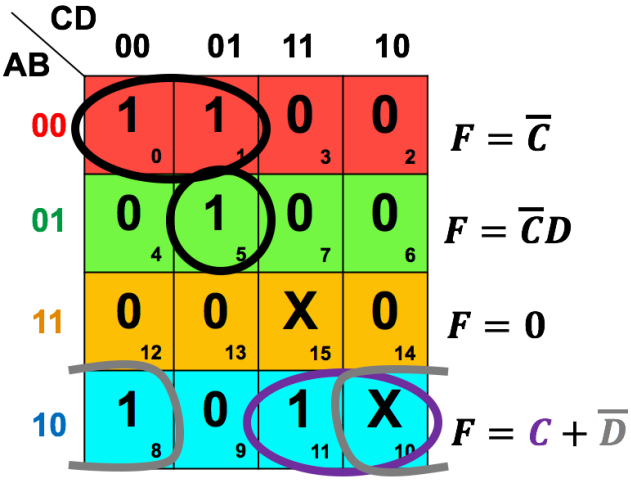


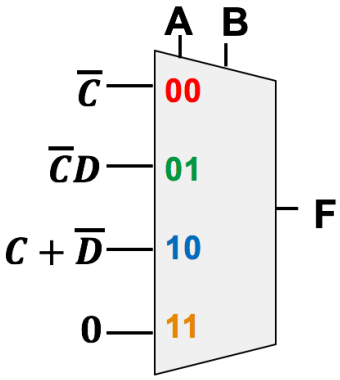
h) $F(A,B,C,D) = \sum m(2,3,6,11,13)$



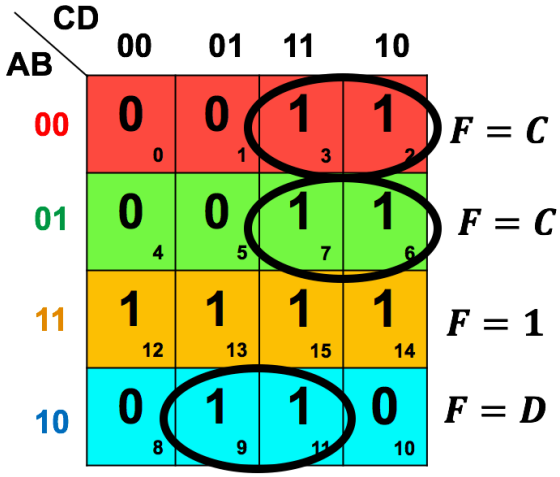


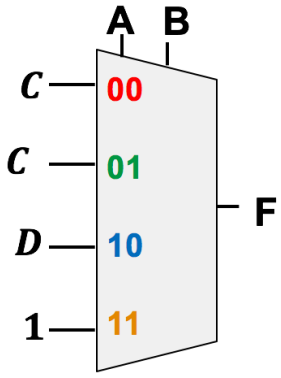
i) $F(A,B,C,D) = \sum m(0,1,5,8,11) + \sum d(10,15)$





j) $F(A,B,C,D) = A\,\overline{B}CD + A\,\overline{B}\,\overline{C}D + \overline{A}\,BC\overline{D} + \overline{A}\,BCD + \overline{A}\,\overline{B}C + AB$

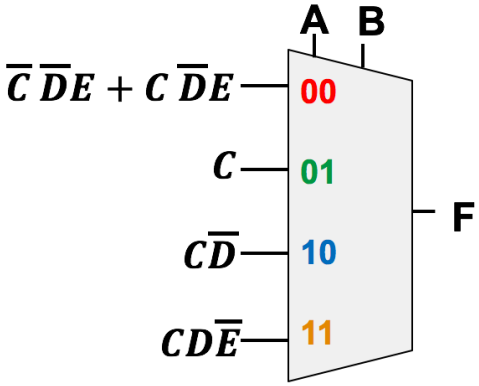




k) $F(A,B,C,D,E) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}\,C\,\overline{D}E + \overline{A}\,BC + A\overline{B}C\overline{D} + ABCD\overline{E}$

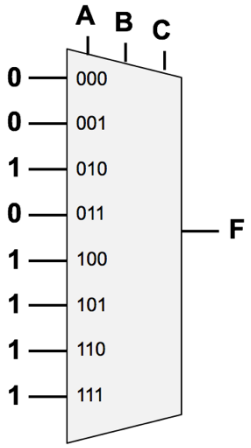
$$F(A,B,C,D,E) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}C\,\overline{D}E + \overline{A}\,BC + A\overline{B}C\overline{D} + ABCD\overline{E}$$

$$F(A,B,C,D,E) = \overline{A}\,\overline{B}(\overline{C}\,\overline{D}E + C\,\overline{D}E) + \overline{A}\,B(C) + A\overline{B}(C\overline{D}) + AB(CD\overline{E})$$

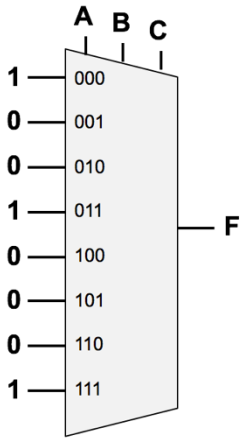


2.

a) $F(A,B,C) = \sum m(2,4,5,6,7)$

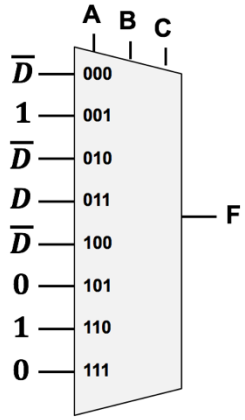


b) $F(A,B,C) = \sum m(0,3,7) + \sum d(1,2)$



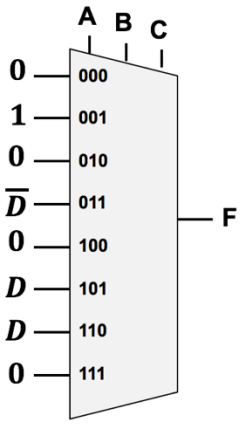
c) $F(A,B,C,D) = \sum m(0,2,3,4,7,8,12,13)$

A	B	C	D	F	
0	0	0	0	1	$F = \overline{D}$
0	0	0	1	0	
0	0	1	0	1	$F = 1$
0	0	1	1	1	
0	1	0	0	1	$F = \overline{D}$
0	1	0	1	0	
0	1	1	0	0	$F = D$
0	1	1	1	1	
1	0	0	0	1	$F = \overline{D}$
1	0	0	1	0	
1	0	1	0	0	$F = 0$
1	0	1	1	0	
1	1	0	0	1	$F = 1$
1	1	0	1	1	
1	1	1	0	0	$F = 0$
1	1	1	1	0	



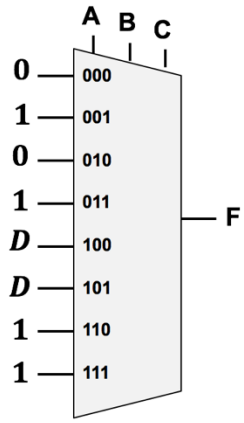
d) $F(A,B,C,D) = \sum m(2,3,6,11,13)$

A	B	C	D	F	
0	0	0	0	0	$F = 0$
0	0	0	1	0	
0	0	1	0	1	$F = 1$
0	0	1	1	1	
0	1	0	0	0	$F = 0$
0	1	0	1	0	
0	1	1	0	1	$F = \overline{D}$
0	1	1	1	0	
1	0	0	0	0	$F = 0$
1	0	0	1	0	
1	0	1	0	0	$F = D$
1	0	1	1	1	
1	1	0	0	0	$F = D$
1	1	0	1	1	
1	1	1	0	0	$F = 0$
1	1	1	1	0	



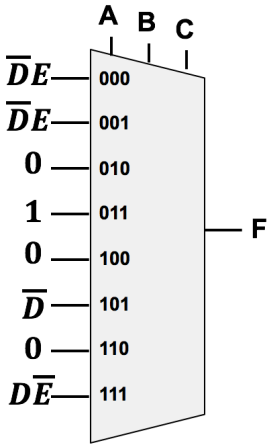
e) $F(A,B,C,D) = A\,\overline{B}CD + A\,\overline{B}\,\overline{C}D + \overline{A}\,BC\overline{D} + \overline{A}\,BCD + \overline{A}\,\overline{B}C + AB$

A	B	C	D	F	
0	0	0	0	0	$F = 0$
0	0	0	1	0	
0	0	1	0	1	$F = 1$
0	0	1	1	1	
0	1	0	0	0	$F = 0$
0	1	0	1	0	
0	1	1	0	1	$F = 1$
0	1	1	1	1	
1	0	0	0	0	$F = D$
1	0	0	1	1	
1	0	1	0	0	$F = D$
1	0	1	1	1	
1	1	0	0	1	$F = 1$
1	1	0	1	1	
1	1	1	0	1	$F = 1$
1	1	1	1	1	



f) $F(A,B,C,D,E) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}\,C\,\overline{D}E + \overline{A}\,BC + A\overline{B}C\overline{D} + ABCD\overline{E}$

$$F(A,B,C,D,E) = \underbrace{\overline{A}\,\overline{B}\,\overline{C}(\overline{D}E)}_{000} + \underbrace{\overline{A}\,\overline{B}C(\overline{D}E)}_{001} + \underbrace{\overline{A}\,BC(1)}_{011} + \underbrace{A\overline{B}C(\overline{D})}_{101} + \underbrace{ABC(D\overline{E})}_{111}$$



3.

a)

$$F(A,B,C) = \overline{A}(B) + A(BC + \overline{B})$$

$$F(A,B,C) = \overline{A}B + ABC + A\overline{B}$$

b)

$$F(A,B,C) = \overline{A}\,\overline{B}(C) + \overline{A}\,B(0) + A\overline{B}(\overline{C}) + AB(1)$$

$$F(A,B,C) = \overline{A}\,\overline{B}C + A\overline{B}\,\overline{C} + AB$$

c)

$$F(A,B,C,D) = \overline{A}\,\overline{B}(C) + \overline{A}\,B(\overline{C} + \overline{D}) + A\overline{B}(\overline{C}\,\overline{D}) + AB(\overline{C}\,\overline{D} + \overline{C}D)$$

$$F(A,B,C,D) = \overline{A}\,\overline{B}C + \overline{A}B\overline{C} + \overline{A}B\overline{D} + A\overline{B}\,\overline{C}\,\overline{D} + AB\overline{C}\,\overline{D} + AB\overline{C}D$$

d)

$$F(A,B,C,D) = \overline{A}\,\overline{B}(C\overline{D}) + \overline{A}\,B(\overline{D}) + A\overline{B}(\overline{C} + CD) + AB(\overline{C}D)$$

$$F(A,B,C,D) = \overline{A}\,\overline{B}C\overline{D} + \overline{A}B\overline{D} + A\overline{B}\,\overline{C} + A\overline{B}CD + AB\overline{C}D$$

e)

$$F(A,B,C,D) = \overline{B}\,\overline{C}(A) + \overline{B}C(\overline{D}) + B\overline{C}(AD) + BC(\overline{A}D)$$

$$F(A,B,C,D) = \overline{B}\,\overline{C}A + \overline{B}C\overline{D} + B\overline{C}AD + BC\overline{A}D$$

$$F(A,B,C,D) = A\overline{B}\,\overline{C} + \overline{B}C\overline{D} + AB\overline{C}D + \overline{A}BCD$$

f)

$$F(A,B,C,D) = \overline{C}\,\overline{D}(\overline{A}\,\overline{B}) + \overline{C}D(A\overline{B}) + C\overline{D}(1) + CD(\overline{A})$$

$$F(A,B,C,D) = \overline{C}\,\overline{D}\,\overline{A}\,\overline{B} + \overline{C}DA\overline{B} + C\overline{D} + CD\overline{A}$$

$$F(A,B,C,D) = \overline{A}\,\overline{B}\,\overline{C}\,\overline{D} + A\overline{B}\,\overline{C}D + C\overline{D} + \overline{A}CD$$