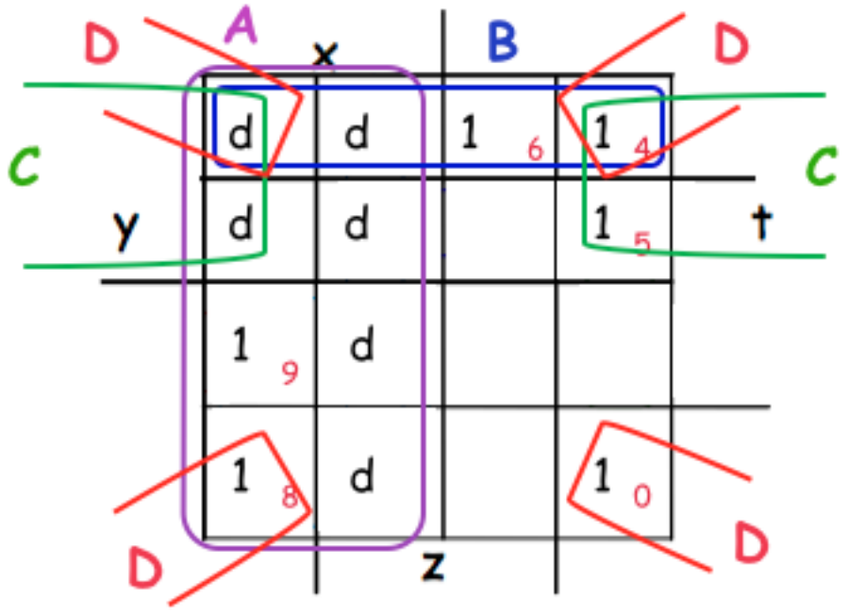
CL=CSCI 160

CLASS 16

HW 15.1 Finish this by going on to finding all minimal forms for F_6.

Solution



From Class 15 we have:

	x	y	z	t	F_6
0	0	0	0	0	1
1	0	0	0	1	0
2	0	0	1	0	0
3	0	0	1	1	0
4	0	1	0	0	1
5	0	1	0	1	1
6	0	1	1	0	1
7	0	1	1	1	0
8	1	0	0	0	1
9	1	0	0	1	1
10	1	0	1	0	d
.	1	0	1	1	d
.	1	1	0	0	d
.	1	1	0	1	d
.	1	1	1	0	d
15	1	1	1	1	d

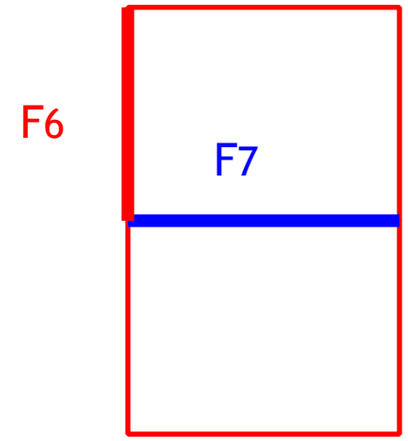
All implicants are essential ---> only 1 minimal form:

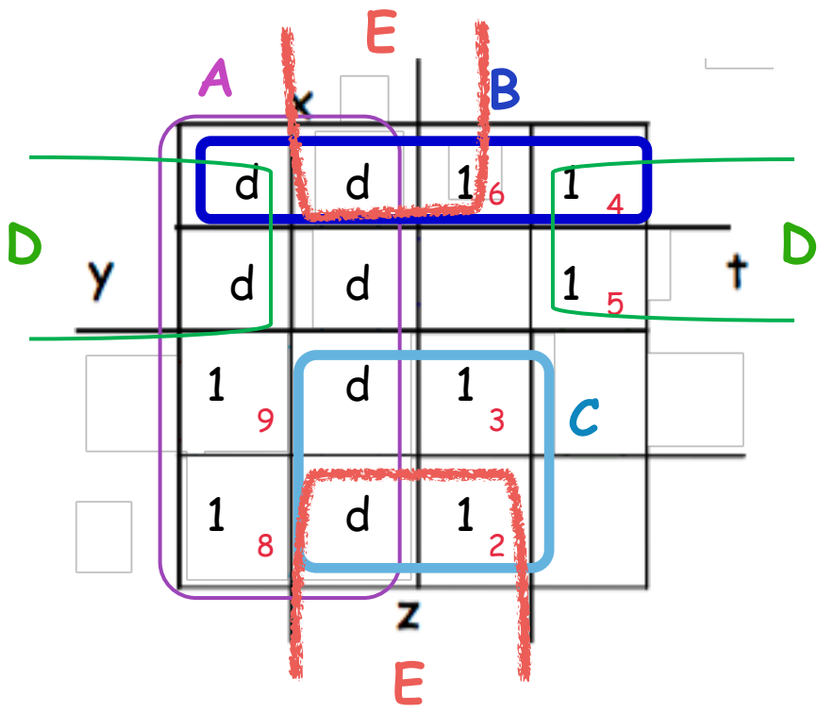
$$F_6 = A + B + C + D$$

$$F_6 = x + yt' + yz' + z't'$$

HW 15.2 Find all minimal forms for F_7.

Solution





	x	y	z	t	F_7
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	1
3	0	0	1	1	1
4	0	1	0	0	1
5	0	1	0	1	1
6	0	1	1	0	1
7	0	1	1	1	0
8	1	0	0	0	1
9	1	0	0	1	1
10	1	0	1	0	d
.	1	0	1	1	d
.	1	1	0	0	d
.	1	1	0	1	d
.	1	1	1	0	d
15	1	1	1	1	d

Essential: A, C, D ---> 2 minimal forms to cover the remaining 1_6:

$$F_7 = A + C + D + \begin{cases} B \\ E \end{cases} = x + y'z + yz' + \begin{cases} yt' \\ zt' \end{cases}$$

Tabulation Method (Quine-McCluskey)

Example: $f = \sum(1, 2, 3, 4, 7, 8, 12, 15) + d\sum(0, 5, 9, 10, 14)$

Index	Impl. Binary	Impl. Dec.	
0	0000	0 *	d
	0001	1 *	
	0010	2 *	
1	0100	4 *	
	1000	8 *	
	0011	3 *	
	0101	5 *	d
2	1001	9 *	d
	1010	10 *	d
	1100	12 *	
3	0111	7 *	
	1110	14 *	d
4	1111	15 *	

Index	Impl. Binary	Impl. Dec.	
0	000-	(0, 1) *	
	00-0	(0, 2) *	
	0-00	(0, 4) *	
	-000	(0, 8) *	
1	00-1	(1, 3) *	
	0-01	(1, 5) *	
	-001	(1, 9) *	
	001-	(2, 3) *	
	-010	(2, 10) *	
	010-	(4, 5) *	
	-100	(4, 12) *	
	100-	(8, 9) *	
	10-0	(8, 10) *	
	1-00	(8, 12) *	
2	0-11	(3, 7) *	
	01-1	(5, 7) *	
	1-10	(10, 14) *	
	11-0	(12, 14) *	
3	-111	(7, 15)	I
	111-	(14, 15)	H

Index	Impl. Binary	Impl. Dec.	
0	00--	(0, 1, 2, 3)	G
	0-0-	(0, 1, 4, 5)	F
	-00-	(0, 1, 8, 9)	E
	-0-0	(0, 2, 8, 10)	D
	--00	(0, 4, 8, 12)	C
1	0--1	(1, 3, 5, 7)	B
	1--0	(8, 10, 12, 14)	A

We stop when we can no longer form larger ones and name the **prime implicants**.

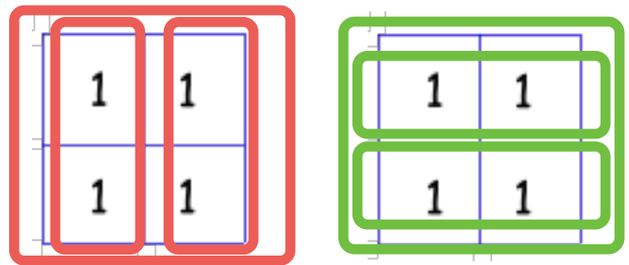
Note: We can form larger implicants **only** by combining implicants of adjacent indices

Index = # of 1's in the string

We list all the minterms in binary and decimal form, grouped by their indices.

We mark the d's. These are the size-1 implicants. We continue to size-2, size-4, etc implicants, until no more possible, marking the non-prime implicants with *

Note: every size-4 implicant will be formed in 2 ways out of size-2 implicants:



HW 16 - assigned

Consider the function on which we applied the tabulation method:

f = Σ (1, 2, 3, 4, 7, 8, 12, 15) + d Σ (0, 5, 9, 10, 14))

1) Draw the K-map and find all prime implicants, giving them the same labels (letters), A - I, in class, when applying the tabulation method.

2) Minimize f.