

Digitális rendszerek és számítógép architektúrák házi feladat

$F = \sum(3, 12, 13, 14, 15, 20, 21, 22, 23, 24, 26, 28, 29, 30, 31, 32, 33, 34, 35, 38, 39, 44, 45, 46, 47, 48, 50, 52, 54, 56, 57, 58, 59, 60, 61, 62, 63)$

1. Minimális bemenetek száma: 6, mivel $2^6 = 64$

Igazságtáblázatuk:

Minterm	A	B	C	D	E	F	Bináris súly
32	1	0	0	0	0	0	1
3	0	0	0	0	1	1	2
12	0	0	1	1	0	0	2
20	0	1	0	1	0	0	2
24	0	1	1	0	0	0	2
33	1	0	0	0	0	1	2
34	1	0	0	0	1	0	2
48	1	1	0	0	0	0	2
13	0	0	1	1	0	1	3
14	0	0	1	1	1	0	3
21	0	1	0	1	0	1	3
22	0	1	0	1	1	0	3
26	0	1	1	0	1	0	3
28	0	1	1	1	0	0	3
35	1	0	0	0	1	1	3
38	1	0	0	1	1	0	3
44	1	0	1	1	0	0	3
50	1	1	0	0	1	0	3
52	1	1	0	1	0	0	3
56	1	1	1	0	0	0	3
15	0	0	1	1	1	1	4
23	0	1	0	1	1	1	4
29	0	1	1	1	0	1	4
30	0	1	1	1	1	0	4
39	1	0	0	1	1	1	4
45	1	0	1	1	0	1	4
46	1	0	1	1	1	0	4
54	1	1	0	1	1	0	4
57	1	1	1	0	0	1	4
58	1	1	1	0	1	0	4
60	1	1	1	1	0	0	4

31	0	1	1	1	1	1	5
47	1	0	1	1	1	1	5
59	1	1	1	0	1	1	5
61	1	1	1	1	0	1	5
62	1	1	1	1	1	0	5
63	1	1	1	1	1	1	6

2. Quine-McCluskey függvényminimalizálási eljárás:

Implikáns	Dec. különbség
3, 35	32
12, 13	1
12, 14	2
12, 28	16
12, 44	32
13, 15	2
13, 29	16
13, 45	32
14, 15	1
14, 30	16
14, 46	32
15, 31	16
15, 47	32
20, 21	1
20, 22	2
20, 28	8
20, 52	32
21, 23	2
21, 29	8
22, 23	1
22, 30	8
22, 54	32
23, 31	8
24, 26	2
24, 28	4
24, 56	32
26, 30	4
26, 58	32
28, 29	1
28, 30	2
28, 60	32
29, 31	2
29, 61	32

30, 31	1
30, 62	32
31, 63	32
32, 33	1
32, 34	2
32, 48	16
33, 35	2
34, 38	4
34, 50	16
35, 39	4
38, 39	1
38, 46	8
38, 54	16
39, 47	8
44, 45	1
44, 46	2
44, 60	16
45, 47	1
45, 61	16
46, 47	1
46, 62	16
47, 63	16
48, 50	2
48, 52	4
48, 56	8
50, 54	4
50, 58	8
56, 60	4
54, 62	8
56, 57	1
56, 58	2
56, 60	4
57, 59	2
57, 61	4
58, 59	1

58, 62	4
59, 63	4
60, 61	1

60, 62	2
61, 63	2
62, 63	1

Implikáns	Dec. különbség
12, 13, 14, 15	1, 2
12, 13, 28, 29	1, 16
12, 13, 44, 45,	1, 32
12, 14, 28, 30	2, 16
12, 28, 44, 60	16, 32
13, 15, 29, 31	2, 16
13, 15, 45, 47	2, 32
13, 29, 45, 61	16, 32
14, 15, 46, 47	1, 16
14, 30, 46, 62	1, 32
15, 31, 47, 63	16, 32
20, 21, 28, 29	16, 32
20, 21, 22, 23	1, 2
20, 22, 28, 30	2, 8
20, 22, 52, 54	2, 32
20, 28, 52, 60	8, 32
21, 23, 29, 31	2, 8
22, 23, 30, 31	1, 8
22, 30, 54, 62	8, 32
24, 26, 28, 30	2, 4
24, 26, 56, 58	2, 32
24, 28, 56, 60	4, 32
26, 30, 58, 62	4, 32
28, 29, 30, 31	1, 2

28, 29, 60, 61	1, 32
28, 30, 60, 62	2, 32
29, 31, 61, 63	2, 32
30, 31, 62, 63	1, 32
32, 33, 34, 35	1, 2
32, 34, 48, 50	2, 16
34, 35, 38, 39	1, 4
34, 38, 50, 54	4, 16
38, 39, 46, 47	1, 8
38, 46, 54, 62	8, 16
44, 45, 46, 47	1, 2
44, 45, 60, 61	1, 16
44, 46, 60, 62	2, 16
45, 47, 61, 63	2, 16
46, 47, 62, 63	1, 16
48, 50, 52, 54	2, 4
48, 52, 56, 60	2, 8
50, 54, 58, 62	4, 8
52, 54, 60, 62	4, 8
56, 57, 58, 59	2, 8
56, 57, 60, 61	1, 2
56, 58, 60, 62	2, 4
57, 59, 61, 63	2, 4
58, 59, 62, 63	1, 4
60, 61, 62, 63	1, 2

Implikáns	Dec. különbség
12, 13, 14, 15, 28, 29, 30, 31	1, 2, 16
12, 13, 14, 15, 44, 45, 46, 47	1, 2, 32
12, 13, 28, 29, 44, 45, 60, 61	1, 16, 32
12, 14, 28, 30, 44, 46, 60, 62	2, 16, 32
13, 15, 29, 31, 45, 47, 61, 63	2, 16, 32
14, 15, 30, 31, 46, 47, 62, 63	1, 16, 32

20, 21, 22, 23, 28, 29, 30, 31	1, 2, 8
20, 22, 28, 30, 52, 54, 60, 62	2, 8, 32
24, 26, 28, 30, 56, 58, 60, 62	2, 4, 32
28, 29, 30, 31, 60, 61, 62, 63	1, 2, 32
44, 45, 46, 47, 60, 61, 62, 63	1, 2, 16
48, 50, 52, 54, 56, 58, 60, 62	2, 4, 8
56, 57, 58, 59, 60, 61, 62, 63	1, 2, 4

Implikáns	Dec. különbség
12, 13, 14, 15, 28, 29, 30, 31, 44, 45, 46, 47, 60, 61, 62, 63	1, 2, 16, 32

	Prímimplikáns	A	B	C	D	E	F	3	12	13	14	15	20	21	22	23	24	26	28	29	30	31	32	33	34	35	38	39	44	45	46	47	48	50	52	54	56	57	58	59	60	61	62	63		
a	12, 13, 14, 15, 28, 29, 30, 31, 44, 45, 46, 47, 60, 61, 62, 63	-	-	1	1	-	-		x	x	x	x							x	x	x	x							x	x	x	x									x	x	x	x	CD	
b	20, 21, 22, 23, 28, 29, 30, 31	0	1	-	1	-	-						x	x	x	x			x	x	x	x																								ABD
c	20, 22, 28, 30, 52, 54, 60, 62	-	1	-	1	-	0						x		x				x		x																								BDF	
d	24, 26, 28, 30, 56, 58, 60, 62	-	1	1	-	-	0												x	x	x	x																							BCF	
e	48, 50, 52, 54, 56, 58, 60, 62	1	1	-	-	-	0																																							ABF
f	56, 57, 58, 59, 60, 61, 62, 63	1	1	1	-	-	-																																							ABC
g	32, 33, 34, 35	1	0	0	0	-	-																	x	x	x	x																		ABCD	
h	32, 34, 48, 50	1	-	0	0	-	0																	x		x																				ACDF
i	34, 35, 38, 39	1	0	0	-	1	-																			x	x	x	x																	ABCE
j	34, 38, 50, 54	1	-	0	-	1	0																			x		x																		ACEF
k	38, 39, 46, 47	1	0	-	1	1	-																				x	x																		ABDE
l	38, 46, 54, 62	1	-	-	1	1	0																					x																		ADEF
m	3, 35	-	0	0	0	1	1	x																			x																			BCDEF

A megjelölt prímimplikánsok segítségével felírható:

$$S = maaa(b+c)b(b+c)bdd(a+b+c+d)(a+b)(a+b+c+d)(a+b)(g+h)g(g+h+i+j)(g+i+m)(i+j+k+l) \\ (i+k)aa(a+k+l)(a+k)(e+h)(e+h+j)(c+e)(c+e+j+l)(d+e+f)f(d+e+f)f(a+c+d+e+f)(a+f) \\ (a+c+d+e+f)(a+f)$$

A logikai műveletek azonosságait felhasználva:

$$S = ambd g f(i+j+k+l)(i+k)(h+e)(h+j+e)(c+e)(j+l+c+e)$$

Algebrai alakban így írható:

$$F = CD + ABD + BCF + ABF + ABC + ABCD + ABCE + BCDEF$$

A logikai áramkör:

