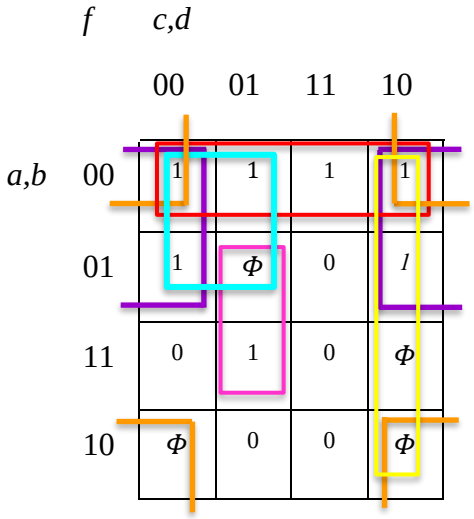
Istanbul Technical University

BLG 231E - Digital Circuits
Assignment 3
Solution Key

1.a)



The set of all prime implicants: bc'd , a'd', a'b' , a'c' , b'd' , cd'

1.b)

Group A1	0	0000	→
Group A2	1	0001	→
	2	0010	→
	4	0100	→
	8	1000	→
Group A3	3	0011	→
	5	0101	→
	6	0110	→
	10	1010	→
Group A4	13	1101	→
	14	1110	→

Group B1	0,1	000-	→
(A1, A2)	0,2	00-0	→
	0,4	0-00	→
	0,8	-000	→
Group B2	1,3	00-1	→
(A2, A3)	1,5	0-01	→
	2,3	001-	→
	2,6	0-10	→
	2,10	-010	→
	4,5	010-	→
	4,6	01-0	→
	8,10	10-0	→
Group B3	6,14	-110	→
(A3, A4)	5,13	-101	✓
	10,14	1-10	→

Group C1	0,1,2,3	00--	✓
(B1, B2)	0,1,4,5	0-0-	✓
	0,2,4,6	0--0	✓
	0,2,8,10	-0-0	✓
Group C2	2,610,14	--10	✓
(B1, B2)			

The set of all prime implicants: bc'd , a'd' , a'b' , a'c' , b'd' , cd'

2.

Prime implicant chart:

	0	1	2	3	4	6	13	a,b,c,d	cost
bc'd							X	-101	7
a'b'	X	X	X	X				00--	6
a'c'	X	X			X			0-0-	6
a'd'	X		X		X	X		0--0	6
b'd'	X		X					-0-0	6
cd'			X			X		--10	5

Selected prime implicants: a'b', bc'd

Reduced Prime implicant chart:

	4	6	a,b,c,d	cost
a'c'	X		0-0-	6
a'd'	X	X	0--0	6
b'd'			-0-0	6
cd'		X	--10	5

Selected prime implicant: a'd'

Minimal expression for the function with the lowest cost:

f(a,b,c,d) = a'b' + a'd' + bc'd

Total cost: 19