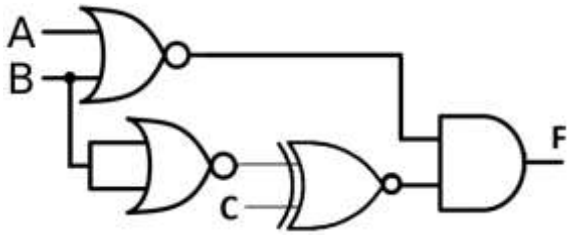
Sheet #2
Boolean Algebra & Circuits Design

Exercise #1

a) Draw the correspondent circuit of this Boolean expression: $\overline{A \cdot (\overline{C} + D)} \equiv (B \oplus E)$

b) Give the logic expression of the output F and fill its the truth table.



Exercise #2

Complete:

$\bar{A} + 0 =$ $\bar{A} \cdot 1 =$ $B + BC =$

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

Simplify $(\bar{A} + B)(\bar{A} + \bar{B}) =$

Simplify using consensus theorem $A\bar{B} + C\bar{A} + C\bar{B} =$

Exercise #3

Design a logic circuit that permits to compare two binary words (A_1A_0)and (B_1B_0). The result is obtained by three outputs:

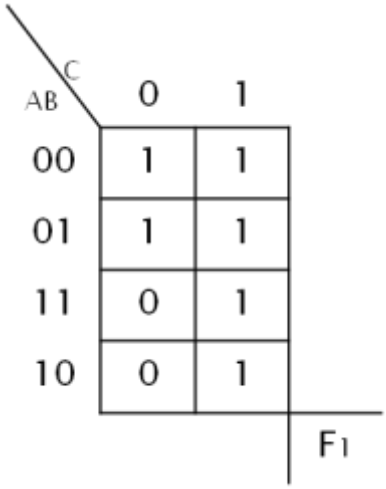
G (= 1 if A>B), E (= 1 if A=B) and L (= 1 if A<B).

Exercise #4

1. Design a circuit for a half-adder (to add two bits),
2. Design a circuit for a full-adder (to add two bits and a carry),
3. Design a circuit permitting to add two binary words (4-bits each),
4. Use the same previous steps to do the subtraction,
5. How can we merge the two circuits to have a universal circuit?

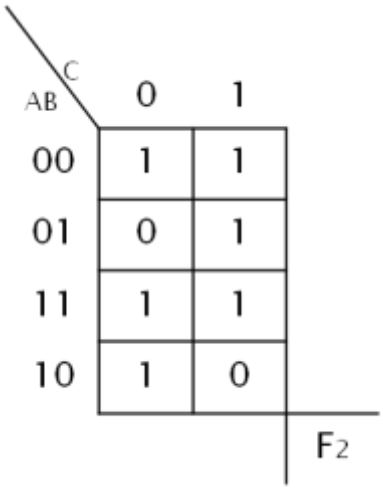
Exercise #5

Give the Boolean expressions of F_1 to F_7.



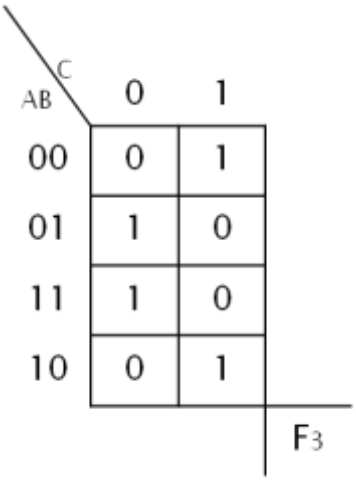
AB \ C	0	1
00	1	1
01	1	1
11	0	1
10	0	1

F_1



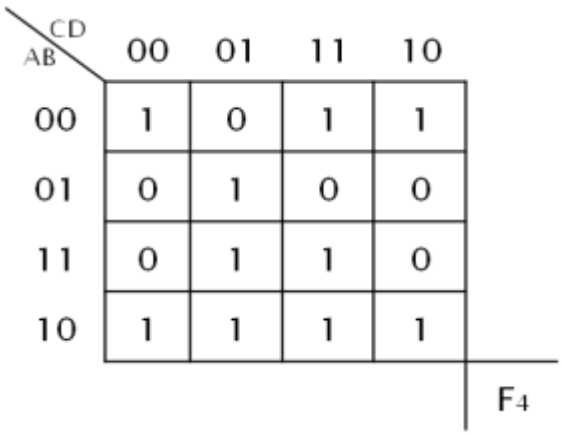
AB \ C	0	1
00	1	1
01	0	1
11	1	1
10	1	0

F_2



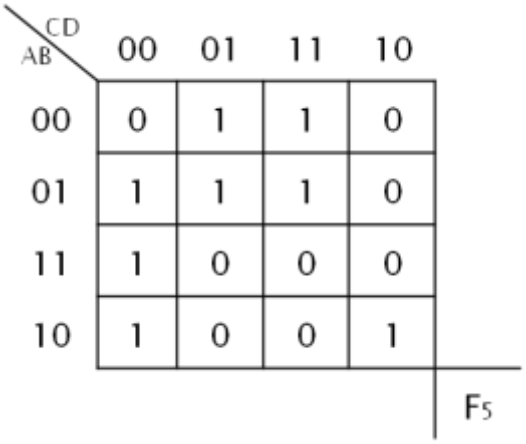
AB \ C	0	1
00	0	1
01	1	0
11	1	0
10	0	1

F_3



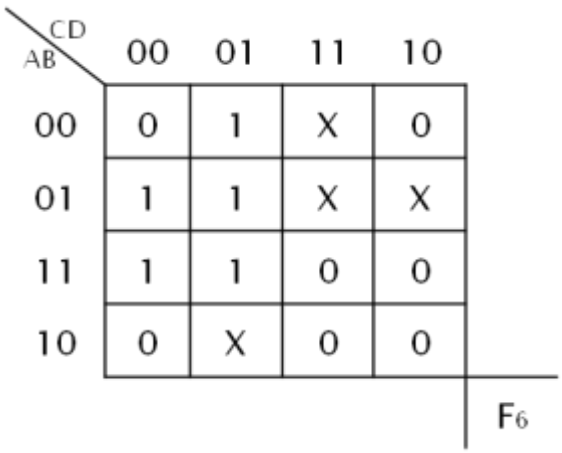
AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	0	0
11	0	1	1	0
10	1	1	1	1

F_4



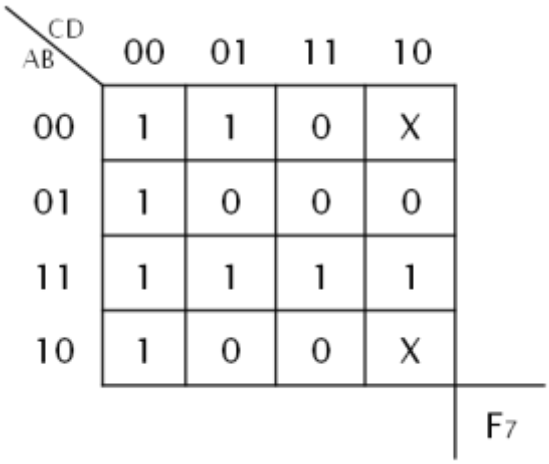
AB \ CD	00	01	11	10
00	0	1	1	0
01	1	1	1	0
11	1	0	0	0
10	1	0	0	1

F_5



AB \ CD	00	01	11	10
00	0	1	X	0
01	1	1	X	X
11	1	1	0	0
10	0	X	0	0

F_6



AB \ CD	00	01	11	10
00	1	1	0	X
01	1	0	0	0
11	1	1	1	1
10	1	0	0	X

F_7