ELG3331
Tutorial on Chapter 13

P13.11 Use the truth table

A	B	C	BC	$B\overline{C}$	$\overline{B}A$	$BC + B\overline{C} + \overline{B}A$	$A + B$
1	1	1	1	0	0	1	1
1	1	0	0	1	0	1	1
1	0	1	0	0	1	1	1
1	0	0	0	0	1	1	1
0	1	1	1	0	0	1	1
0	1	0	0	1	0	1	1
0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0

We prove that the expression is true.

P13.14: Use Boolean algebra

$$f(A,B,C,D) = ABC + \overline{A}CD + \overline{B}CD$$
$$= ABC + CD\left(\overline{A} + \overline{B}\right)$$

P13.21

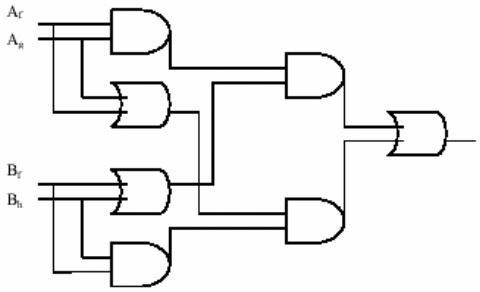
The four variables are the flow and the height of water in the tank A and in the tank B: A_f, A_h, B_f, B_h.

From the Karnaugh map reported below we can find the minimum expression:

$$A_f A_h\left(B_f + B_h\right) + B_f B_h\left(A_f + A_h\right)$$

and the following realization of the circuit.

$A_f A_h$ \ $B_f B_h$	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	0	1	0	1
10	0	0	1	0

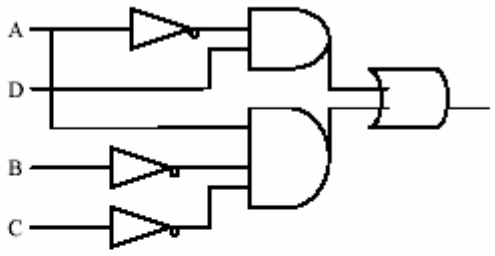


P13.22

Let's design two different circuits for the buzzer and the starting conditions.
For both circuits we find first the Karnaugh map and then the minimum expression and the circuit to implement it.
A = Ignition key (1 if turned); B = Door (1 if closed); C = Seat belt (1 if fasten); D = Lights (1 if on);
E = Park (1 if on);
For the first circuit:

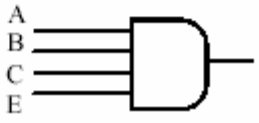
$$Buzzer = A\overline{BC} + \overline{A}D$$

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

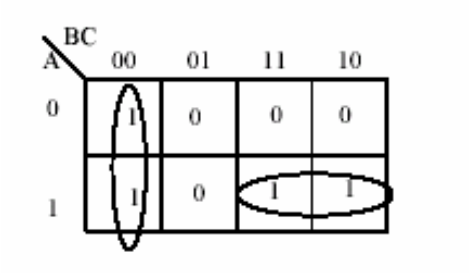


$$Start = ABCE$$

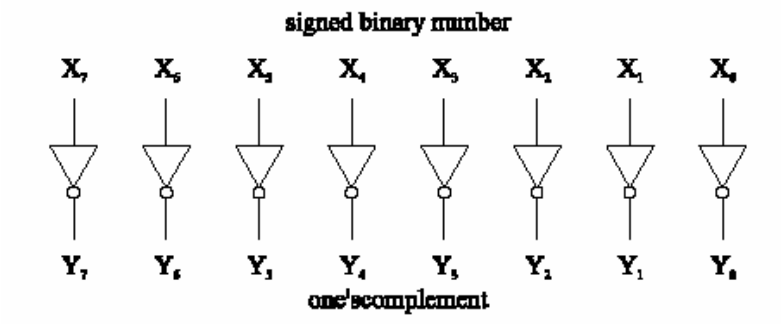
CE \ AB	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	1	0
10	0	0	0	0



P13.24



P13-31



P13.35

a)

x	y	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

b) Binary Addition - S is the sum, and C is the carry.