Homework Lecture 1

1. Exercise A.1

2. Exercise A.4

3. Exercise A.7

4. Exercise A.8;

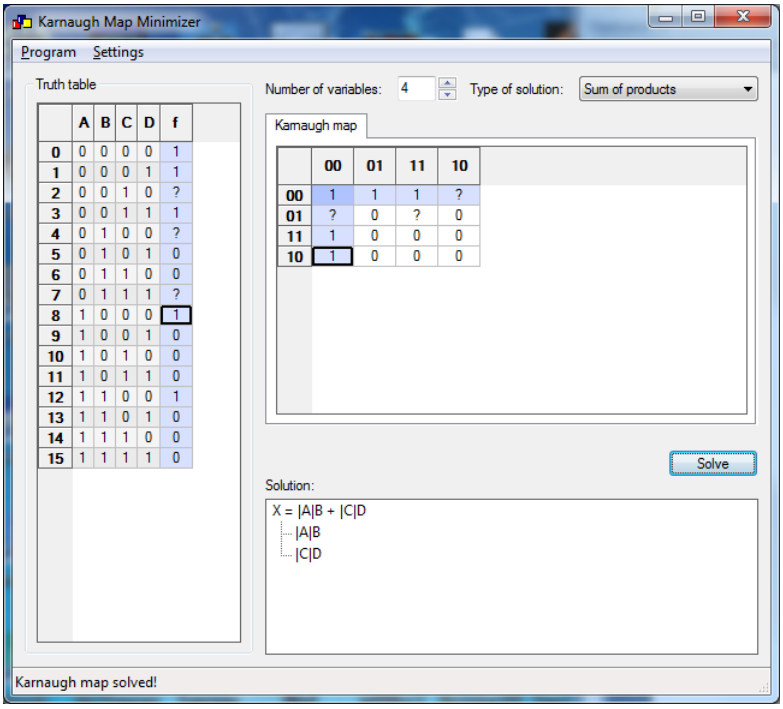
5. Exercise A.14

6. A property of the GRAY code is that there is exactly 1 bit change between two consecutive numbers. The GRAY code is also used in the Karnaugh map.
Give the sequence of sixteen consecutive GRAY numbers. Start with number 0000.

7. Exercise A.37

Karnaugh map, more information needed? See
http://www.allaboutcircuits.com/vol_4/chpt_8/7.html

With the "Karnaugh Map Minimizer" you find the relation between the Truth Table, Karnaugh map and a minimal solution in SOP-form (and POS-form for EE students only).
http://sourceforge.net/projects/k-map/files/k-map/0.4/



Notes:
1) '?' is 'd' (don't care in the book)
2) The maximum of variables used in de K-map in this course is 4.
3) Notice that the GRAY code is used in the rows in columns (and not the binary code).
4) **|C** is used instead of $\bar{C}$ (also C' is used).
5) When R, S and T are inputs, and you have the AND of these inputs. Write this as: $R \cdot S \cdot T$ and not RST (otherwise names can have only one character!!!)

6) The assignment of the inputs A, B. C and D to the columns is not relevant. You often see two alternatives (in the field the number of the minterm is given: $A \times 2^3 + B \times 2^2 + C \times 2^1 + D \times 2^0$):

CD

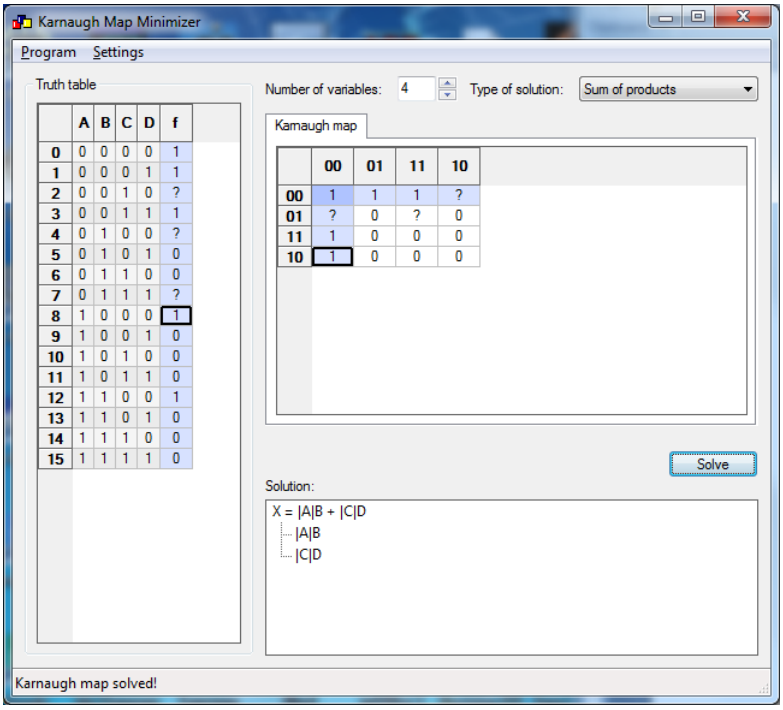
AB	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

Used in the K-map simulator

AB

CD	00	01	11	10
00	0	4	12	8
01	1	5	13	9
11	3	7	15	10
10	2	6	14	11

Used in the book



Additional (for EE students; "Digital Hardware"): finding the minimal POS-form.

You can find the POS-form with the Karnaugh map with the following procedure:

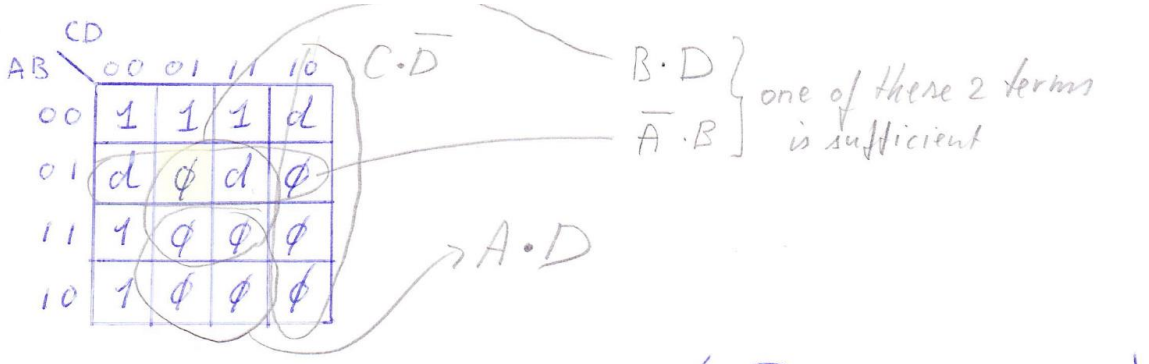
1- Find the minimal SOP-form for the INVERSE (i.e. grouping the zeros instead of the ones).

2- Take the complement (NOT) of the SOP-form

3- Use DeMorgan for the OR term

4- Use deMorgan for the NAND term(s)

The steps are given below for this example.



1) $\overline{F} = \bar{A} \cdot B + A \cdot D + B \cdot D$ (or $\overline{F} = B \cdot D + A \cdot D + \bar{B} \cdot D$)

2) $\overline{\overline{F}} = \overline{\bar{A} \cdot B + A \cdot D + B \cdot D}$

3) $F = \overline{\bar{A} \cdot B} \cdot \overline{A \cdot D} \cdot \overline{B \cdot D}$

4) $F = (A + \bar{B})(\bar{A} + \bar{D})(\bar{B} + \bar{D})$