Logic System Assignment 1

A simple CAD tool based on K-map
Due date: 2016/04/15

1. Description

In this homework, you will write a program to implement a (2 ~ 4-Variable) K Map simplification process. The prime implicants and the essential prime implicants of the K Map should be indicated, too. Finally, your program should show the Minimum SOP (Sum of Product).

2. Requirement

i. **Read the input file**
Your program will read the input file for the minterm information and don't care information:
eg. $F(A, B, C, D) = \sum m(0,1,5,10,14) + \sum d(4,7,11,15)$
The format of the information are followed by Input/Output Specification.

ii. **Initialize the terms in the K Map, and do the simplification**
You can create one or two-dimensional arrays to allocate all the terms of K Map. The order should follow the **order in this assignment**.

iii. **Write the output file**
When the program starts execution, print the initial contents of K-Map at first. Also, you must print the prime implicants, the essential prime implicants and the boolean algebra to show the Minimum SOP.
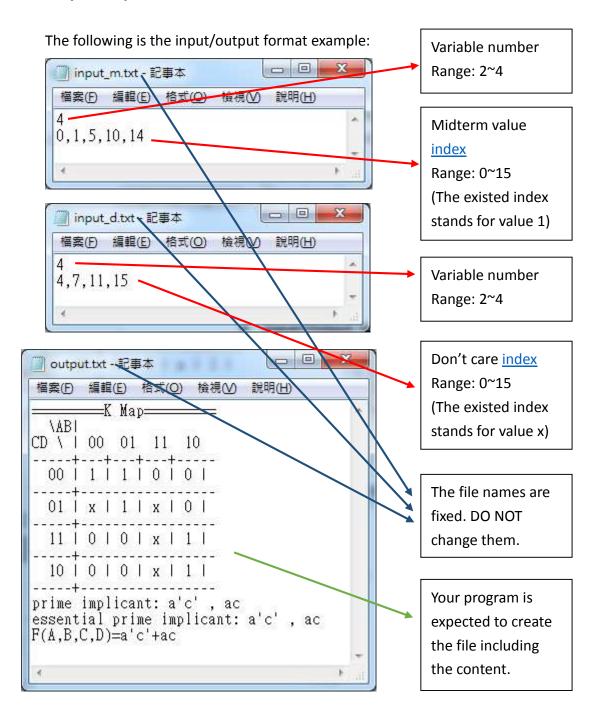
3. Input/Output Specification

i. File Specification

You can finish your program in C, C++, or Java.

Your program should read input file, and put these terms into K-map. After program execution, output file should be created to dump the information for the simplification results.

Input: input_m.txt, input_d.txt

Output: output.txt

The following is the input/output format example:

input_m.txt - 記事本
檔案(F)　編輯(E)　格式(O)　檢視(V)　說明(H)
```
4
0,1,5,10,14
```

Variable number
Range: 2~4

Midterm value index
Range: 0~15
(The existed index stands for value 1)

input_d.txt - 記事本
檔案(F)　編輯(E)　格式(O)　檢視(V)　說明(H)
```
4
4,7,11,15
```

Variable number
Range: 2~4

Don't care index
Range: 0~15
(The existed index stands for value x)

output.txt - 記事本
檔案(F)　編輯(E)　格式(O)　檢視(V)　說明(H)
```
======K Map======
 \AB|
CD \ | 00  01  11  10
-----+---+---+---+-----
 00 | 1 | 1 | 0 | 0 |
-----+---------------
 01 | x | 1 | x | 0 |
-----+---------------
 11 | 0 | 0 | x | 1 |
-----+---------------
 10 | 0 | 0 | x | 1 |
-----+---------------
prime implicant: a'c' , ac
essential prime implicant: a'c' , ac
F(A,B,C,D)=a'c'+ac
```

The file names are fixed. DO NOT change them.

Your program is expected to create the file including the content.

ii. Kmap order (here not the order from truth table to K map)

1. 4 variable

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

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

Fig1. The index of minterm   Fig2. Example value of minterm

2. 3 variable

AB\C	00	01	11	10
0	0	1	2	3
1	4	5	6	7

Fig3. The index of minterm

3. 2 variable

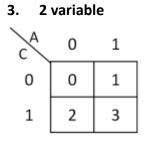| A\C	0	1
0	0	1
1	2	3

Fig4. The index of minterm

4. Hint

You can reference the flow chart below to design your program.