

B10815013

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### Digital Logic Design Project 3 – Exact Boolean Minimization

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For this project, we are required to write a program to minimize Boolean, before writing the program, I search about the Quine-McCluskey algorithm, which is used for the minimization of Boolean function that functionally is identical to Karnaugh mapping, but the tabular form makes it more efficient for use in computer algorithms, and it also gives a deterministic way to check that the minimal form of a Boolean function has been reached. The method is to find all prime implicants of the function and use those prime implicants in a prime implicant chart to find the essential prime implicants of the function, as well as other prime implicants that are necessary to cover the function. After getting the tabular of the function, then I proceed using Dr. Petrick's method.

```
// Data of Quine-VMcCluskey algorithm
struct minterm{
    string binary = "";
    set<int> contentMin;
    bool used = false;
};
vector<vector<minterm> > oneNumber;
```

```
// Data of Petrick's method
vector<minterm> asterisk;
struct sopTerm{
    int sopIndex = 0;
    vector<int> ptr;
};
vector<sopTerm> petrick;
vector<int> expand;
bool first = true;

struct answer {
    vector<int> fewestTerms;
    int totalTerm = 0;
    int totalliteral = 0;
}minimalist;
```

#### 4 Variable .pla file:

Input:

```
File Edit View Search Te
.i 4
.o 1
.ilb a b c d
.ob f
.p 8
00-0 1
0-11 1
1-01 1
0101 1
1111 -
0001 -
100- 1
-01- 1
.e
~
~
```

```
[b10815013@ip150-105 Downloads]$ vi 4varMini
[b10815013@ip150-105 Downloads]$ ./Mini 4va
Total number of terms: 2
Total number of literals: 2
[b10815013@ip150-105 Downloads]$ vi 4varOut
```

Output:

```
File Edit View
.i 4
.o 1
.ilb a b c d
.ob f
.p 2
-0-- 1
---1 1
.e
~
~
```

#### 5 Variable .pla file:

Input:

```
File Edit View Sea
.i 5
.o 1
.ilb a b c d e
.ob f
.p 6
0000- 1
1-0-1 1
1001- 1
111-- 1
-11-1 1
00-10 -
.e
~
~
```

```
[b10815013@ip150-105 Downloads]$ vi 6va
[b10815013@ip150-105 Downloads]$ ./Mini
Total number of terms: 5
Total number of literals: 17
[b10815013@ip150-105 Downloads]$
```

Output:

```
File Edit View Se
.i 5
.o 1
.ilb a b c d e
.ob f
.p 5
0000- 1
-0010 1
1-0-1 1
-11-1 1
111-- 1
.e
~
```

### 6 Variable .pla file:

Input:

```
.i 6
.o 1
.ilb a b c d e f
.ob g
.p 8
00-00 1
0-11- 1
1-001 1
01010 1
11111 -
00001 -
100-- 1
-01-1 1
.e
~
```

```
[b10815013@ip150-105 Downloads]$ vi 5va
[b10815013@ip150-105 Downloads]$ ./Mini
Total number of terms: 6
Total number of literals: 26
```

Output:

```
.i 6
.o 1
.ilb a b c d e f
.ob g
.p 6
01-100 1
1-0010 1
00-0-0 1
100--0 1
-01-10 1
0-11-0 1
.e
~
```