Tabular Method

CSED2020

Mohamed kamal el din Ali(58)

Abd el rahman ahmed mohamed(37)

Table of Contents:

Tabular Method Definition:

Tabular method is a systematic way to get simple form of digital algebra expression. It is very efficient way but it is hard to calculate by human (at least for long and hard expression). So we implement this method to be easy to anyone to use to get his answer and all minimum answer. User should only enter the minterms of the boolean function

Tabular method has two main steps which is:

1-)Grouping by number of ones.

2-)simplification all prime implicant (there is many methods to do it) to reach to all minimum answer

1-)In grouping. we put each expression (which give one as output in truth table) In specific group with rest of expression which have same number of ones , then we group each element in each group with all rest element in other groups by determine all element with hamming distance equal one , if one expression still without grouping it will be prime implicant.

2-) In simplification ,we first get essential prime implicant which only cover we apply branching method (or try and error) which get all minimum solution by try every expression with others

Technology :

We use java language to implement this program and we use windows builder to build Gui (Desktop application) which is very easy to use because it depend on drag and drop system.

In web application we use C# with frame work (ASP.net) which also depend on drag and drop system and generate html code automatically and it is very easy to change css.

Basic functions and classes:

Classes:

class elem:

Description:

It is considered a node for the the program It has two strings ,

one for binary representation(str) and the other for the minterms covering it(nums).

Functions : Constructor Parameter1 assigned to str. Parameter2 assigned to nums.

Functions :

Main function :

Type Static void

Launch the application

Tabular_Method constructor :

Initialize global variables :

Strinput : minterms

Strinputd: don’t cares Call initialize function.

Initialize function :

Type Void

No parameters

Description :

Initializes the contents of the frame

Labels 11

RadioButton 2

Textfield 4

Button

Operate function:

Type Void

No parameters

Description:

Operate is Considered the main function , it’s called on clicking submit button .

Galculates the maximum minterm or don’t care ,

Initialize an 2-d char array contains the binary representation of minterms and don't cares,

Creating a hashmap and group the minterms such that the key is the number of ones ,

Comparing groups

Getmaxint function :

Type Int

Parameters: StringBuilder str2 , int w

Description:

Returns the maximum int to get the number of variables ;

Toarray function :

Type: Void

Parameters: two dimensional array of characters, StringBuilder ,two integers

Description:

Turns the string array of string represents minterms, Then convert it to binary and assign it to the array

1- Prepare function:

- Type: void
- Parameters : linked list of expression and all minterms which was covered by this expression.

- Job: This function will be make every thing ready to make complete search by first call find essential prime implicant function and remove minterms which essential cover and put all rest minterms in linked list, and after complete search this function make sure there no solution bigger than minimum solution And convert the binary string to letter.

2- Find_essential function:

- Type: void

- Parameter: linked list of expression and all minterms which was covered by this expression, linked list of minterms,empty Hash map which has each minterm as a key and linked list of expression which cover this minterm as a value.

- Job:

find essential prime implicant and remove minterms which essential cover and put all rest minterms in linked list.

3- convert_to_string :

- Type: void
- Parameter: array of all letters in English alphabet.
- Job:

Turn boolean expression into string (letters)Expression, there is two of this function one for essential and one for prime implicants.

4- checkcovering function:

- Type: void
- Parameter: linked list of all expression, linked list of all minterms , the index of specific expression, array which indicate each minterm which expression cover.

- Job:

To know if this expression cover any of mainterms which not be covered yet (during complete search).

5- completesearch function:

- Type:

void

- Parameter:

Linked list of all expression, linked list of all minterms, array which indicate which minterm be covered by expressions, index which we will start in it, empty linked list which we will use to take and leave expression during serch.

- Job:

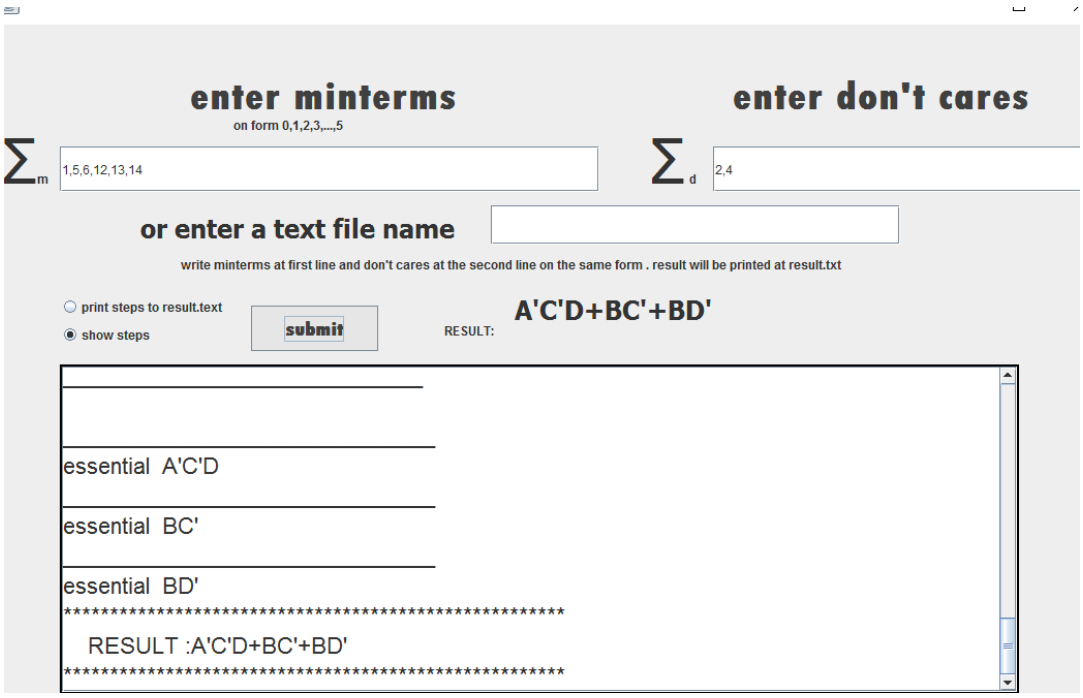
We use complete search to find all minimum solution By trying to take first expression and check if it covers or not if not try to to it with the second expression… and so until we find we cover all minterms then we make check if it has min length or not ,if have we take it if not we will return, then we will take the next expression and make the same trila during this function we call many other function which check if this expression cover min term and add this term to another linked list.

Sample Run:

1-) minterms: 1,5,6,12,13,14

Donot cares: 2,4

Output: (one solution)

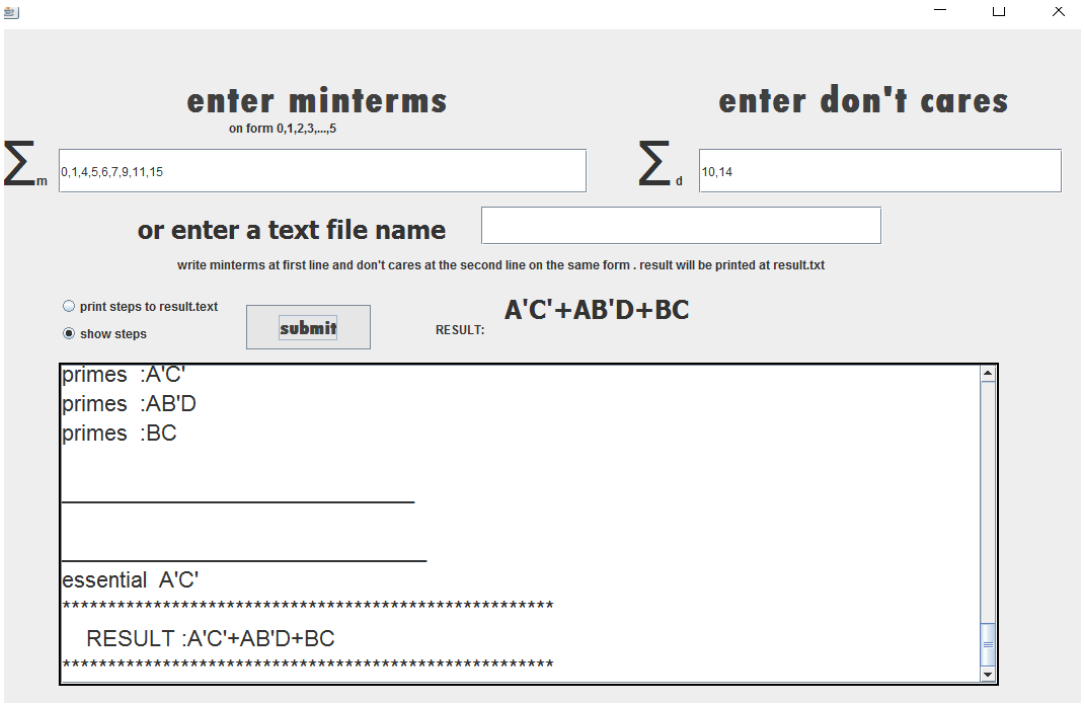


2-)

Mainterms: 0,1,4,5,6,7,9,11,15

Donot care: 10,14

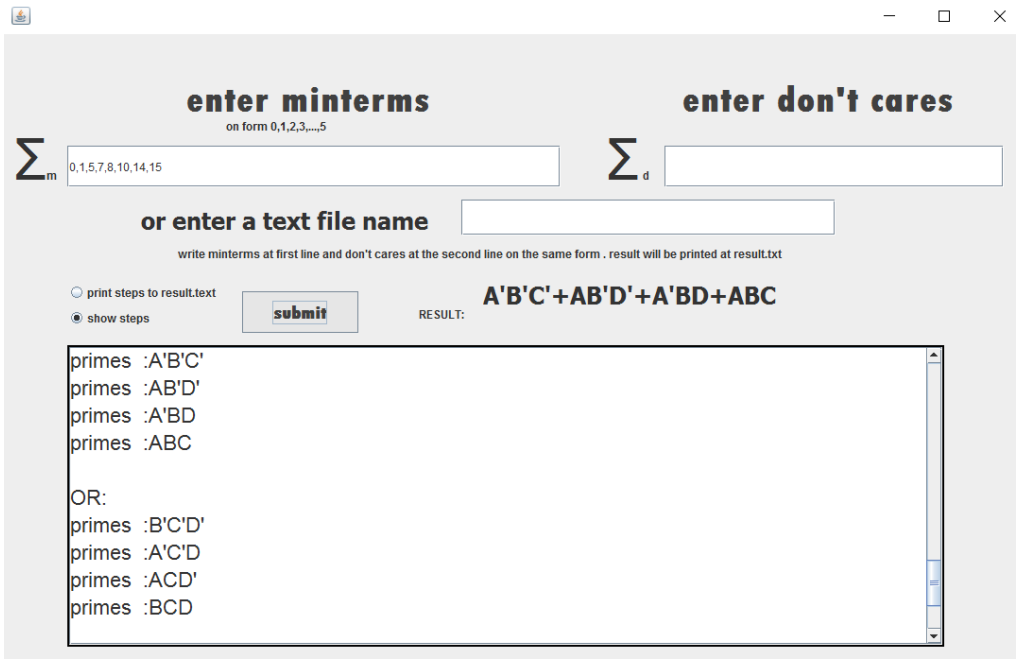
Output: (one solution)



3-) Mineterms: 0,1,5,7,8,10,14,15

Donot care: null

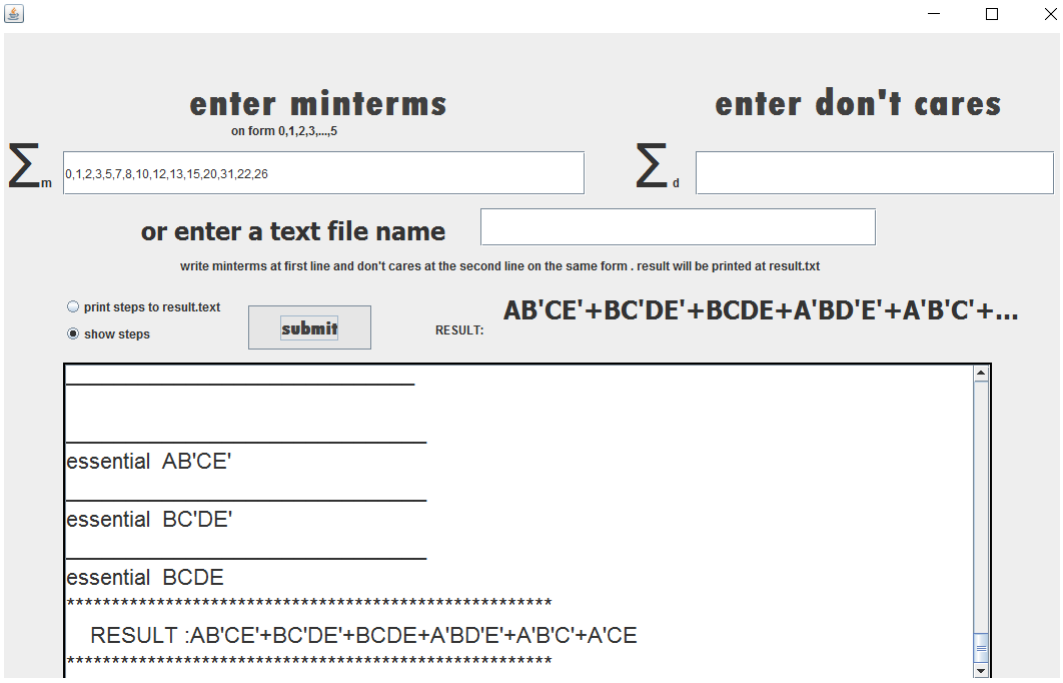
Output: (there is two solution)



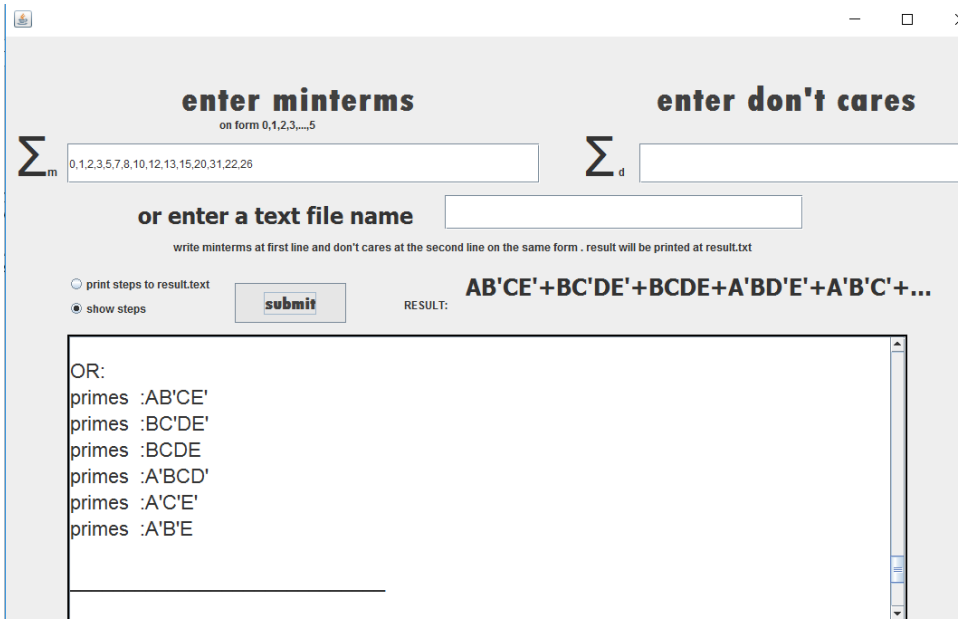
4-) Minterms: 0,1,2,3,5,7,8,10,12,13,15,20,31,22,26

Donot care: null

Output: (there is two solution)



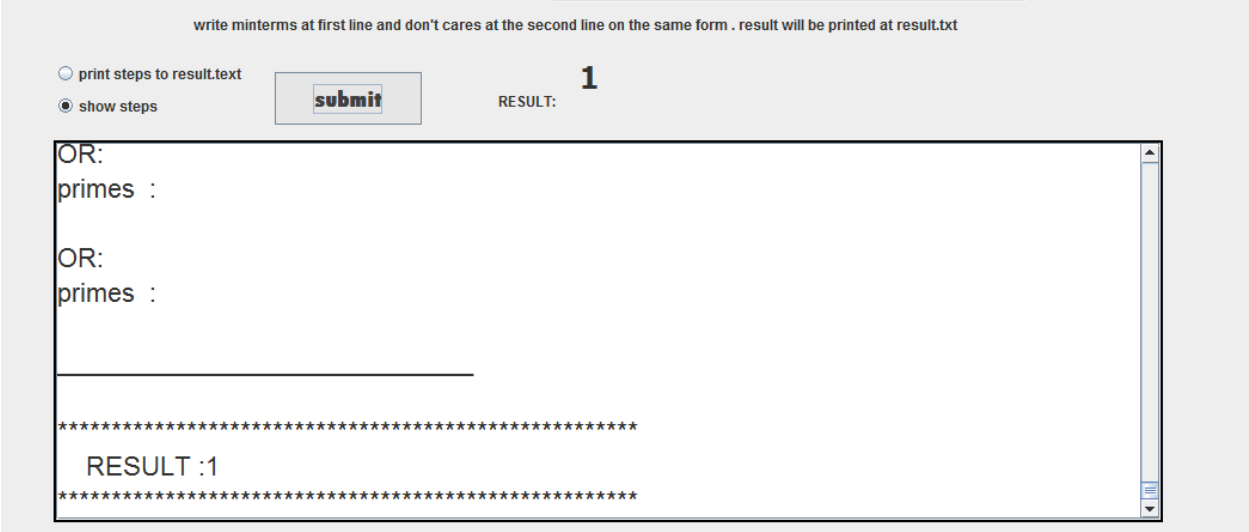
OR:



5- Minterms: 1,4,5,10,12,14,0,2,3,6,7,8,9

Don’t care: 11,13,15

Output : (one solution is one 😊)



Some Notes:

1- We use complete search to find all min answer so that our code complexity is O(2^N) …..N is all implicants without essential.

2- We also use complete search because it is famous which be will very easy to learn

3- We did not use row or column dominance because we know that our method will find the solution by it self and if we used it our complexity will not change in a big range

4- In Gui, incase of any invalid expression there is no result will be show and the color of button will be red

5- We do our best in using suitable data structure to good present data and to make complete search very smooth , we use hash maps ,linked list (some times we used linked of linked list 😊) and arrays.

Guide user:

The software is very easy to use as all the needed instructions are written on the gui .

Firstly you should enter the the minterms and the don't cares on the form :

1,2,3,....,5

For example:0,2,5,6

Don't cares is optional , you can neglect it and leave its text field empty it if you want so .

You may want to use a text file to enter your data . In this case make a text file , put the minterms at the first line , the don't cares at the second line -or leave second line empty-

Then just write the name of the file -without the extension- on its text field and leave the other texts fields empty .

Note that if you entered data in both gui and a text file , the priority would be for gui.

After entering the data , you have 2 options

First one : show steps It will show the steps of solving the problem in details .

Second one : print to result.txt It will print the result with steps to a file called result.txt , if it doesn't exist the program will creat one himself , if it does exists the program will over write it.

Note that if any error happened because of wrong input or problem in calculating, the submit button will turn red .