



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB231 – DIGITAL ELECTRONICS

II YEAR/ III SEMESTER

UNIT 1 – MINIMIZATION TECHNIQUES AND LOGIC GATES

TOPIC - QUINE- MC CLUSKEY METHOD OF MINIMIZATION



WHY QUINE- MC CLUSKEY METHOD OF MINIMIZATION?



- k map is difficult to simplify the Boolean functions having more than 5 variables.
- Quine-Mc Cluskey tabular method is a tabular method based on the concept of prime implicants.



QUINE- MC CLUSKEY METHOD OF MINIMIZATION



Prime Implicants(PI)

- Group of minterms which cannot be combined with any other minterms or groups.

Essential Prime implicants (EPI)

- The essential prime implicant is a prime implicant in which one or more minterms are unique.
- Contains atleast one minterm which is not contained in any other.



QUINE- MC CLUSKEY METHOD OF MINIMIZATION



PROCEDURE:

1. List all minterms in the binary form.
2. Arrange all the minterms accordingly to number of one's contained and from the groups having no one's, one 1's, two 1's, three 1's and so on.
3. Compare each binary numbers with every group in the adjacent next higher category group and they differ only one bit position.
4. Apply the same process described in step 3 for the resultant column and continue the cycles until a single pass through cycle yields further elimination of literals.
5. List all prime Implicants.
6. Select the minimum number of prime implicants which must cover all the minterms.



QUINE- MC CLUSKEY METHOD OF MINIMIZATION-EXAMPLE



Example :-

Simplify the following Boolean function by using a Quine - McCluskey method.

$$F(A, B, C, D) = \sum m (0, 2, 3, 6, 7, 8, 10, 12, 13)$$

Solution:-

1. List all minterms in binary
2. Arrange minterms according to number of 1's

minterm	Binary Representation	minterm	Binary Representation
m_0	0000	m_0	0000 ✓
m_2	0010	m_2	0010 ✓
m_3	0011	m_8	1000 ✓
m_6	0110	m_3	0011 ✓
m_7	0111	m_6	0110 ✓
m_8	1000	m_{10}	1010 ✓
m_{10}	1010	m_{12}	1100 ✓
m_{12}	1100	m_7	0111 ✓
m_{13}	1101	m_{13}	1101 ✓



QUINE- MC CLUSKEY METHOD OF MINIMIZATION



Step	3 & 4	Column (C)	Column (D)
min term	Binary Representation	min terms	Binary Represe
0, 2	00_0 ✓	0, 2, 8, 10	_ 0 _ 0
0, 8	_ 0 0 0 ✓		
2, 3	0 0 1 _ ✓	2, 3, 6, 7	0 _ 1 _
2, 6	0 _ 1 0 ✓		
2, 10	_ 0 1 0 ✓		
8, 10	1 0 _ 0 ✓		
8, 12	1 _ 0 0		
3, 7	0 _ 1 1 ✓		
6, 7	0 1 1 _ ✓		
12, 13	1 1 0 _		



QUINE- MC CLUSKEY METHOD OF MINIMIZATION



Step 5 List the prime Implicants.

prime Implicants		Binary Representation
$A\bar{C}\bar{D}$	8, 12	1 - 0 0
$AB\bar{C}$	12, 13	1 1 0 -
$\bar{B}\bar{D}$	0, 2, 8, 10	- 0 - 0
$\bar{A}C$	2, 3, 6, 7	0 - 1 -



Step: b Select the minimum number of prime implicants which must cover all the minterms

Prime Implicants		m_0	m_2	m_3	m_6	m_7	m_8	m_{10}	m_{12}	m_{13}
$A\bar{C}\bar{D}$	8, 12						⊙		⊙	
$ABC\bar{C}$	12, 13 ✓								⊙	⊙
$\bar{B}\bar{D}$	✓ 0, 2, 8, 10	⊙	⊙				⊙	⊙		
$\bar{A}C$	✓ 2, 3, 6, 7		⊙	⊙	⊙	⊙				

$$F(A, B, C, D) = (110-) + (-0-0) + (0-1-)$$
$$= \underline{\underline{ABC\bar{C} + \bar{B}\bar{D} + \bar{A}C}}$$



APPLICATIONS



- It is more efficient for use in computer algorithms
- It also gives a deterministic way to check that the minimal form of a boolean function has been reached



ASSESSMENTS



1. What is the another name for Quine Mc Cluskey method?
2. The starting point of the tabulation method that specifies the function is the----
3. Unchecked terms in the table forms are-----
4. What is the first tabulation method?
5. State Prime Implicants.



THANK YOU