EE5811 : FPGA LAB
ASSIGNMENT 1

Yeleboina Venkata Lavanya
EE21MTECH11015

Question

Convert the following boolean expression into its canonical POS form

$$F(A,B,C) = (B + \bar{C}).(\bar{A} + B)$$

1 Solution

1.1 Using boolean laws

The given function F has three variables A,B and C.Each OR term in the given expression has one missing variable
From boolean laws,

$$x\bar{x} = 0 \tag{1}$$

From (1) The given boolean expression can be written as

$$F(A,B,C) = (B + \bar{C} + A\bar{A}).(\bar{A} + B + C\bar{C}) \tag{2}$$

We know, from distributive law

$$(x + yz) = (x + y)(x + z) \tag{3}$$

Using (3),the expression (2) can be written as

$$F(A,B,C) = (B + \bar{C} + A).(B + \bar{C} + \bar{A})(\bar{A} + B + C)(\bar{A} + B + \bar{C}) \tag{4}$$

Removing redundant terms,we obtain canonical POS form as

$$F(A,B,C) = (A + B + \bar{C}).(\bar{A} + B + C)(\bar{A} + B + \bar{C}) \tag{5}$$

Each OR term in (5) has all three variables.Thus, the function is expressed as product of maxterms.Hence it is the canonical POS(product of sums) form of given boolean expression.

$$F = M_0 M_4 M_5 \tag{6}$$

1.2 Using truth table

The canonical POS form can also be found using truth table.The truth table for given boolean expression is as follows

A	B	C	F(A,B,C)
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

From truthtable,

$$F = m_0 + m_2 + m_3 + m_6 + m_7 \tag{7}$$

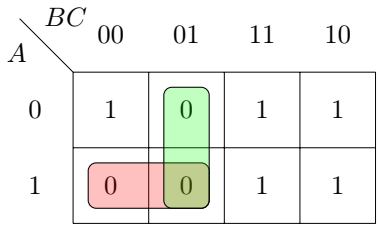
$$F = M_1 M_4 M_5 \tag{8}$$

From (8),The canonical POS form of given expression is

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

2 Verification using KMAP Implementation

The obtained canonical POS expression can be minimized using KMap as shown in Figure.



Using implicants in K-Map,the minimized POS expression is

$$F(A, B, C) = (B + \bar{C}).(\bar{A} + B)$$