EE5811 : FPGA LAB
ASSIGNMENT 1

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1 Problem

Derive a Canonical SOP expression for a Boolean function F, represented by the following truth table

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

2 Solution

2.1 KMAP Implementation

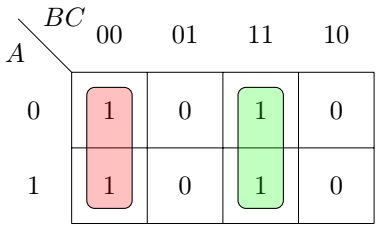

Figure 1: SOP for F using KMAP

The given expression can be minimized using KMap as shown in Figure 1. Using implicants in figure, SOP terms obtained are: $\bar{B}\bar{C} + BC$

2.2 Minimized SOP Expression

$$F = BC + \bar{B}\bar{C} \tag{1}$$

2.3 NAND Expression

To express the given SOP expression using NAND gates, we have

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

$$F(A,B,C) = \overline{(\overline{BC + \bar{B}\bar{C}})} \tag{3}$$

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

2.4 NAND Gate Implementation

Circuit diagram with NAND gates is shown below:

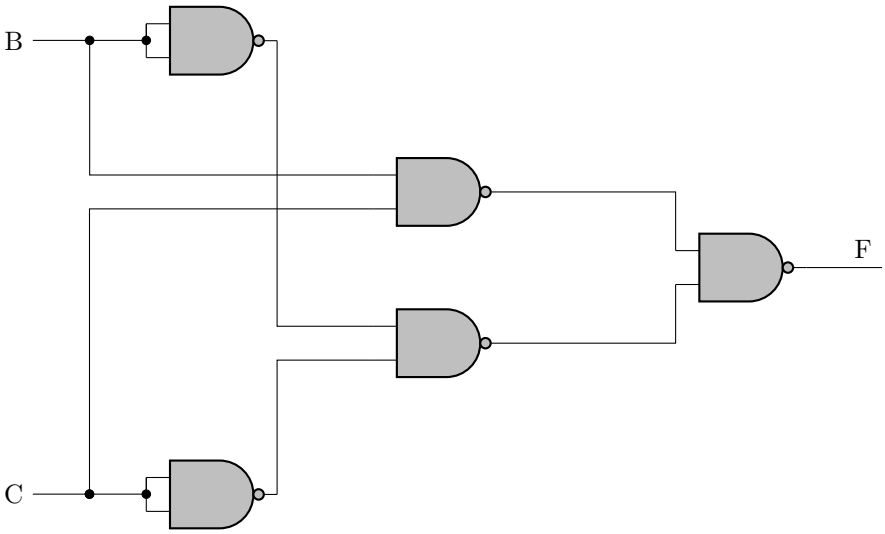

Figure 2: NAND gate implementation for F