DLD Assignment 6

Komireddy Lahari

December 21, 2020

1 Question

A function F(A,B,C) defined by three Boolean variables A, B and C when expressed as sum of products is given by

$$F = \overline{A}.\overline{B}.\overline{C} + \overline{A}.B.\overline{C} + A.\overline{B}.\overline{C} \tag{1}$$

where, $\overline{A}, \overline{B}$, and $\overline{C}$ are the components of the respective variables. The product of sums (POS) form of the function F is

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

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

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

(D) F=($\overline{A}$+$\overline{B}$+C).($\overline{A}$+B+C).(A+$\overline{B}$+C).(A+B+$\overline{C}$).(A+B+C)

2 Solution

2.1 Truth Table

A	B	C	F	Maxterms
0	0	0	1	-
0	0	1	0	$A+B+\overline{C}$
0	1	0	1	-
0	1	1	0	$A+\overline{B}+\overline{C}$
1	0	0	1	-
1	0	1	0	$\overline{A}+B+\overline{C}$
1	1	0	0	$\overline{A}+\overline{B}+C$
1	1	1	0	$\overline{A}+\overline{B}+\overline{C}$

Table 1: *Truth Table for eq.(1)*

1

From the above truth table, we get the following POS expression

$$F = (A + B + \overline{C}).(A + \overline{B} + \overline{C}).(\overline{A} + B + \overline{C}).(\overline{A} + \overline{B} + C).(\overline{A} + \overline{B} + \overline{C}) \quad (2)$$

which is the same as option (C) above.

2.2 K-map

Figure 1: *K-map for eq.(2)*

the simplified POS expression obtained from the Karnaugh map above is

$$F = (\overline{A} + \overline{B}).\overline{C} \quad (3)$$
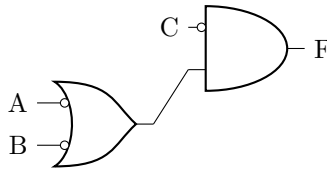
2.3 Circuit Diagram

Figure 2: Circuit diagram for eq.(3)
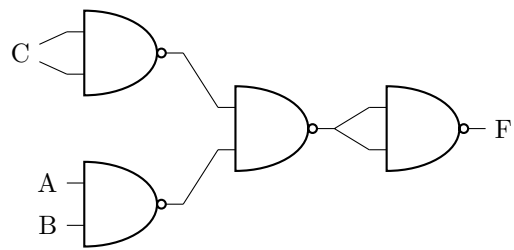
making a logic diagram using only NAND gates, (next page)

2

Figure 3: Circuit diagram using only NAND gates