

Homework 2

CSE 232

April 2021

Question 1

1. Simplify the following Boolean functions by using Karnaugh map method.

(a) $F_1(A, B, C, D) = \sum m(0, 1, 4, 5, 8, 9, 10, 12, 13)$

Solution:

AB\CD	00	01	11	10
00	1	1		
01	1	1		
11	1	1		
10	1	1		1

$$F_1(A, B, C, D) = C' + AB'CD'$$

(b) $F_2(A, B, C, D) = \sum m(3, 5, 7, 8, 9, 10, 11, 13, 15)$

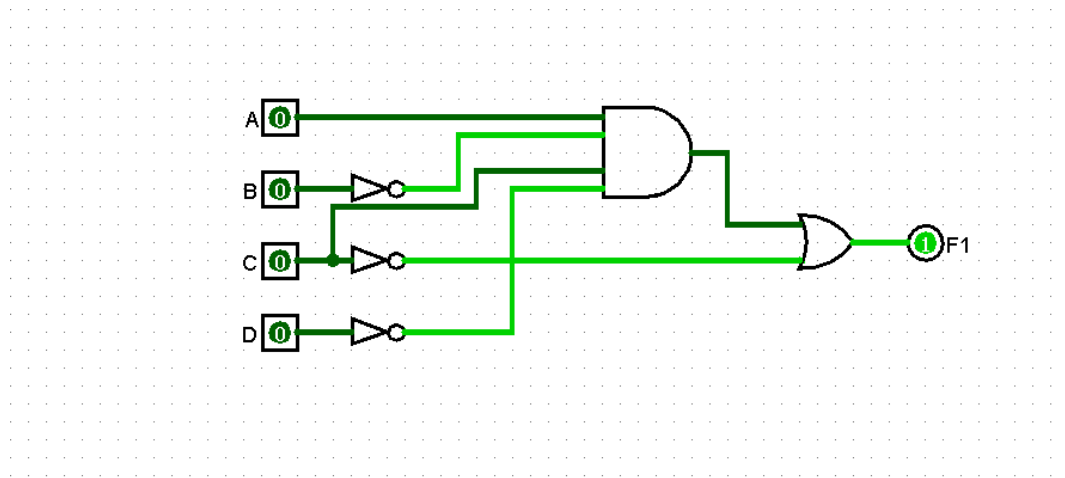
Solution:

AB\CD	00	01	11	10
00			1	
01		1	1	
11		1	1	
10	1	1	1	1

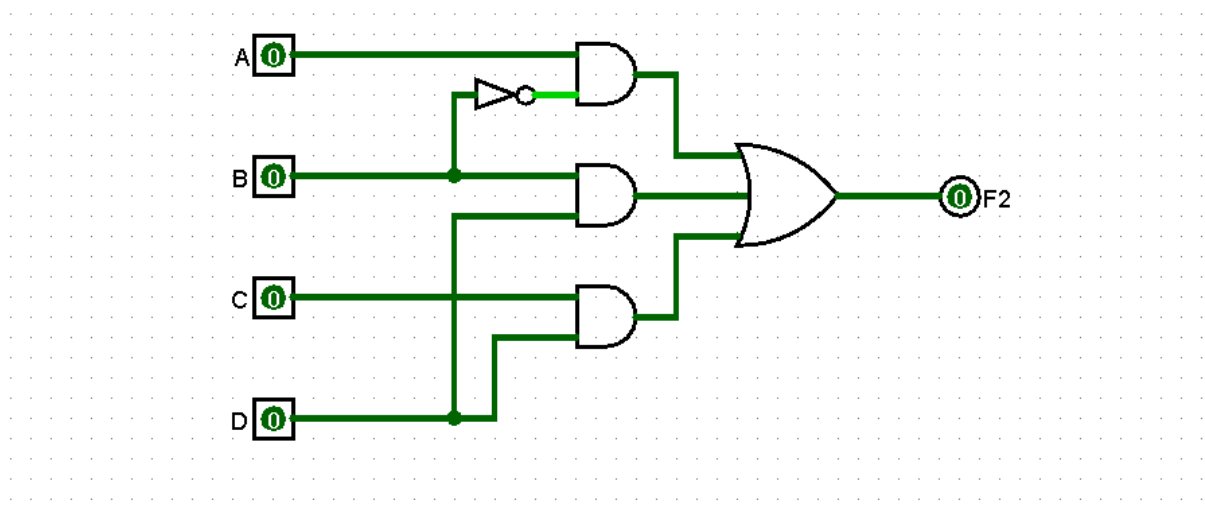
$$F_2(A, B, C, D) = CD + BD + AB'$$

2. Design logic circuits of F1 and F2 for A, B, C and D inputs.

Solution:

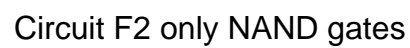


Circuit F1



Circuit F2

Solution:



Question 2

1. Write the truth table that provides the following Boolean function.

$$F = AB' + AD + BC + CD' + A'B'C'D'$$

Solution:

A	B	C	D	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

2. Write the Karnaugh map of the truth table.

AB\CD	00	01	11	10
00	1			1
01			1	1
11		1	1	1
10	1	1	1	1

3. Group all 1's on the Karnaugh map to obtain simplified F function.

AB\CD	00	01	11	10
00	1			1
01			1	1
11		1	1	1
10	1	1	1	1

$$F = B'D' + A'BC + AC + AD$$

$$F = B'D' + A'BC + AC + AD$$

4. Group all 0's on the Karnaugh map to obtain simplified F' function.

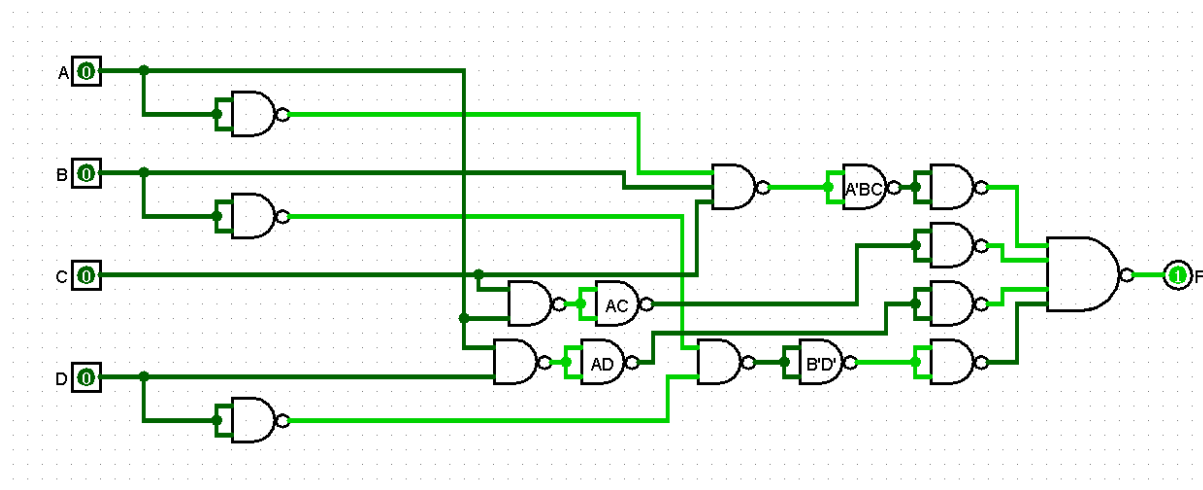
AB\CD	00	01	11	10
00	1	0	0	1
01	0	0	1	1
11	0	1	1	1
10	1	1	1	1

$$F' = A'B'D + A'BC' + ABC'D'$$

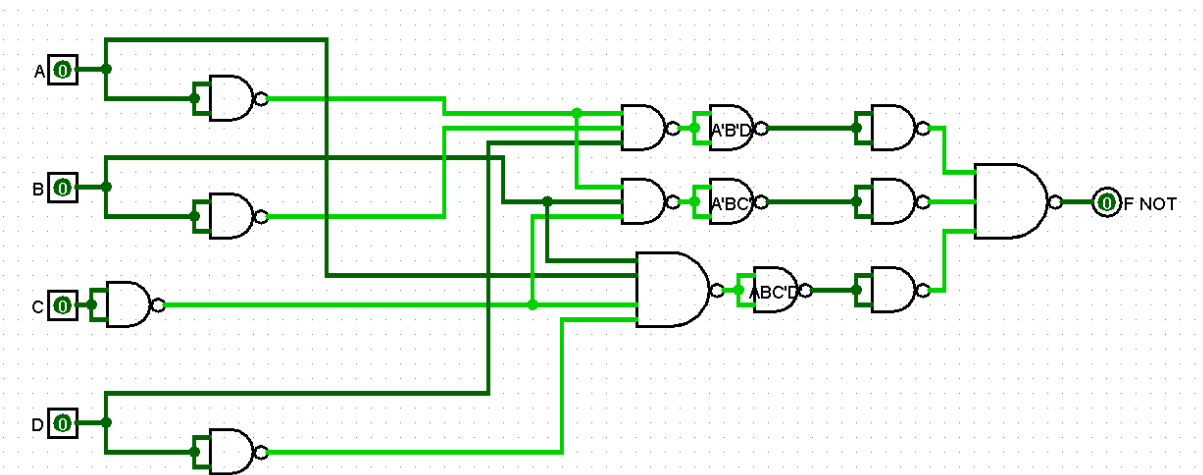
$$F' = A'B'D + A'BC' + ABC'D'$$

5. Design the circuits of F and F' functions by using NAND gates.

Solution:



Circuit F only NAND gates



Circuit NOT F only NAND gates