

Question 1

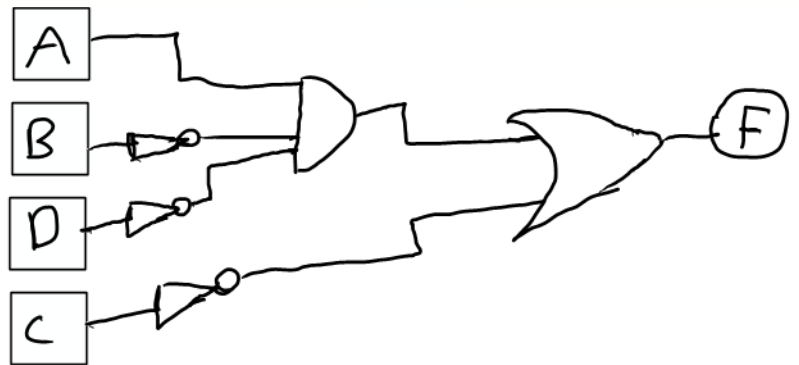
1. Simplify the following Boolean functions by using Karnaugh map method.

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

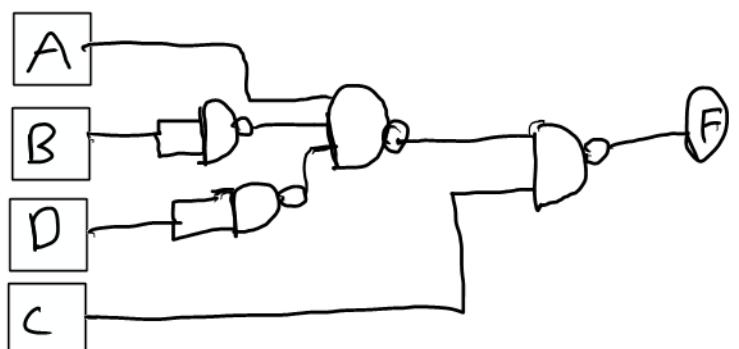
A	B	C	D	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1



2. Design logic circuit of F_1 for A, B, C and D inputs.

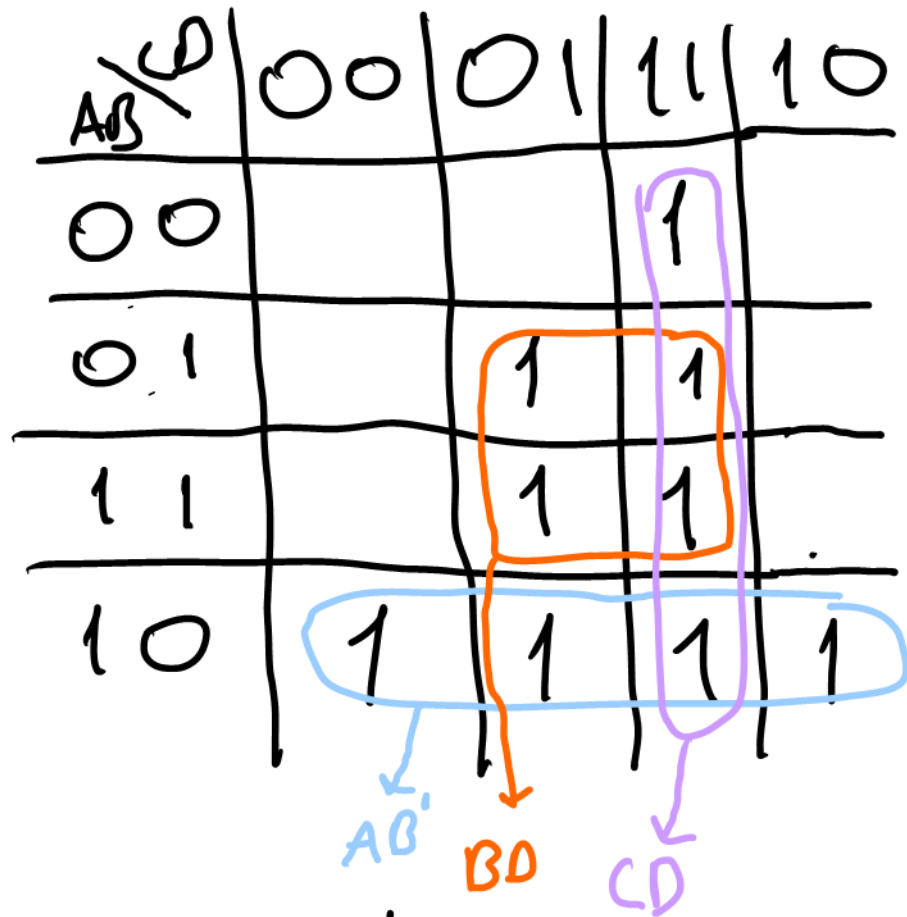


3. Design Logic circuit of F_1 by using only NAND gates as few as possible.



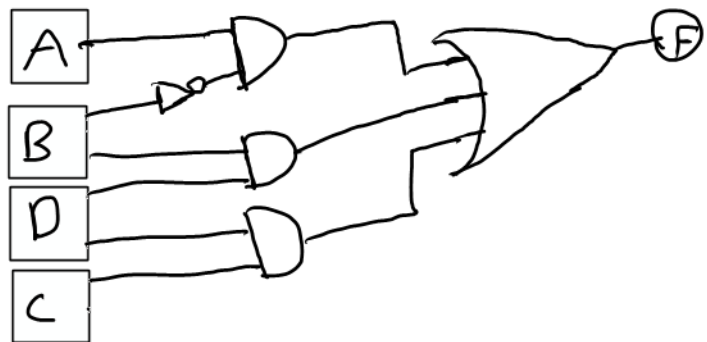
(b) $F_2(A, B, C, D) = \sum m(3, 5, 7, 8, 9, 10, 11, 13, 15)$

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

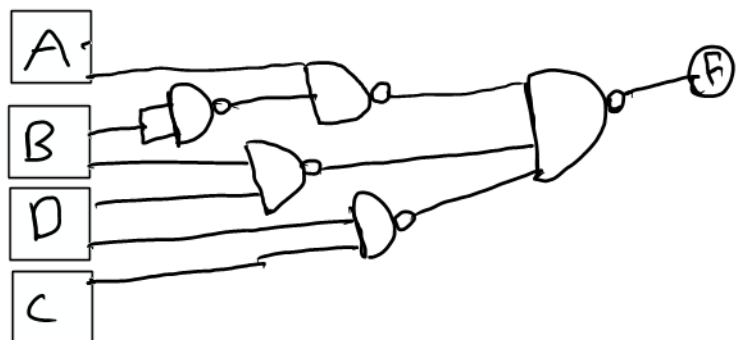


$$F = AB' + BD + CD$$

2. Design logic circuit of F_2 for A, B, C and D inputs.



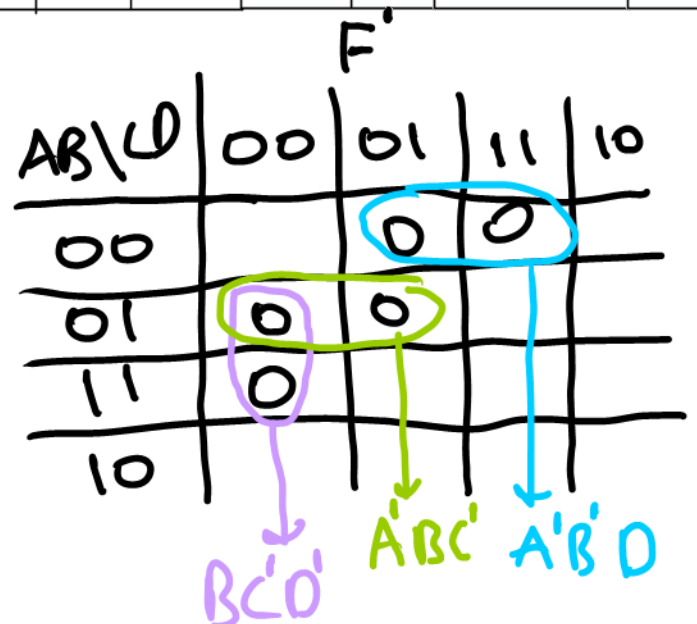
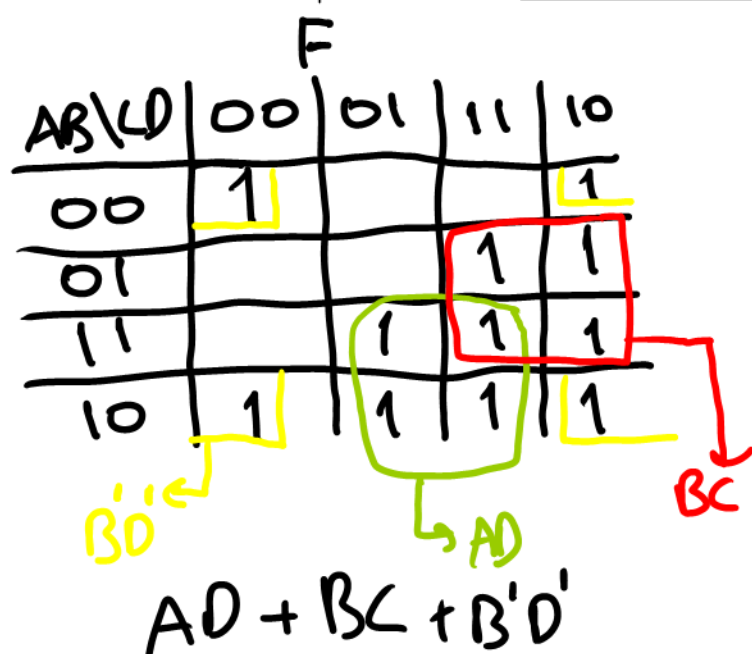
3. Design Logic circuit of F_2 by using only NAND gates as few as possible.



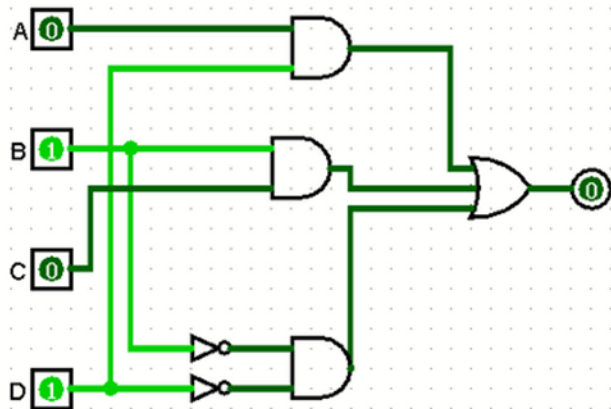
1. Write the truth table that provides the following Boolean function.

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

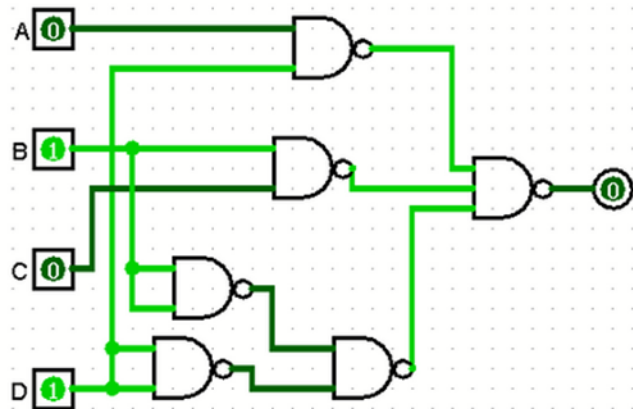
A	B	C	D	A'	B'	C'	D'	AB'	AD	BC	CD'	A'B'C'D'	F
0	0	0	0	1	1	1	1	0	0	0	0	1	1
0	0	0	1	1	1	1	0	0	0	0	0	0	0
0	0	1	0	1	1	0	1	0	0	0	1	0	1
0	0	1	1	1	1	0	0	0	0	0	0	0	0
0	1	0	0	1	0	1	1	0	0	0	0	0	0
0	1	0	1	1	0	1	0	0	0	0	0	0	0
0	1	1	0	1	0	0	1	0	0	1	1	0	1
0	1	1	1	1	0	0	0	0	0	1	0	0	1
1	0	0	0	0	1	1	1	1	0	0	0	0	1
1	0	0	1	0	1	1	0	1	1	0	0	0	1
1	0	1	0	0	1	0	1	1	0	0	1	0	1
1	0	1	1	0	1	0	0	1	1	0	0	0	1
1	1	0	0	0	0	1	1	0	0	0	0	0	0
1	1	0	1	0	0	1	0	0	1	0	0	0	1
1	1	1	0	0	0	0	1	0	0	1	1	0	1
1	1	1	1	0	0	0	0	0	1	1	0	0	1



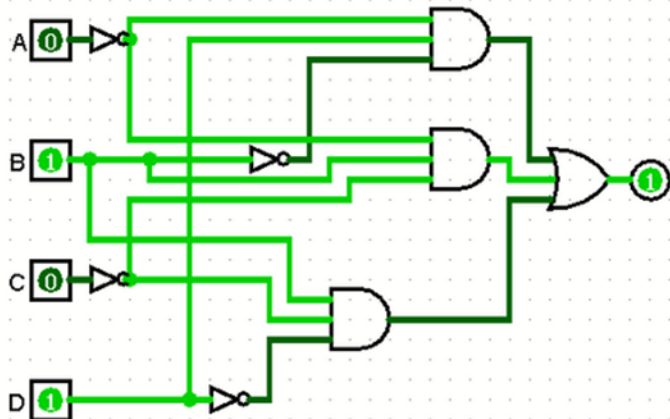
F



F with only nand gates



F'



F' with only nand gates

