Lab 4

To Simplify Boolean Expressions and Implement Respective Digital Circuits Using Karnaugh Map

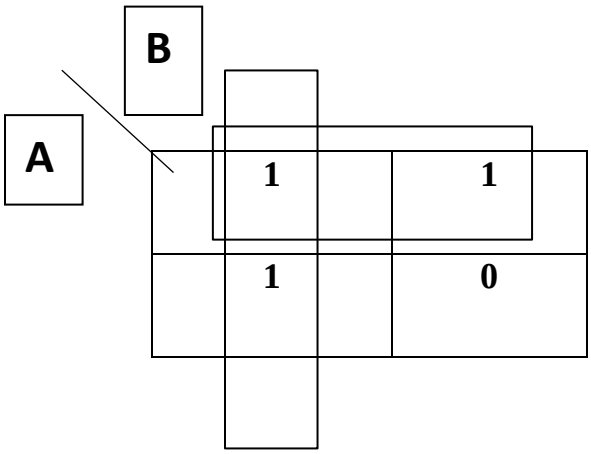
Note: For examples, refer to the following link: https://www.geeksforgeeks.org/introduction-of-k-map-karnaugh-map

Tasks

1. **Construct K-Map for the function given below. Show the simplified output expression and verify the output with the help of software simulation.**

$$Z = f(A,B) = \bar{A}\bar{B} + A\,\bar{B} + \bar{A}B$$

K-Map

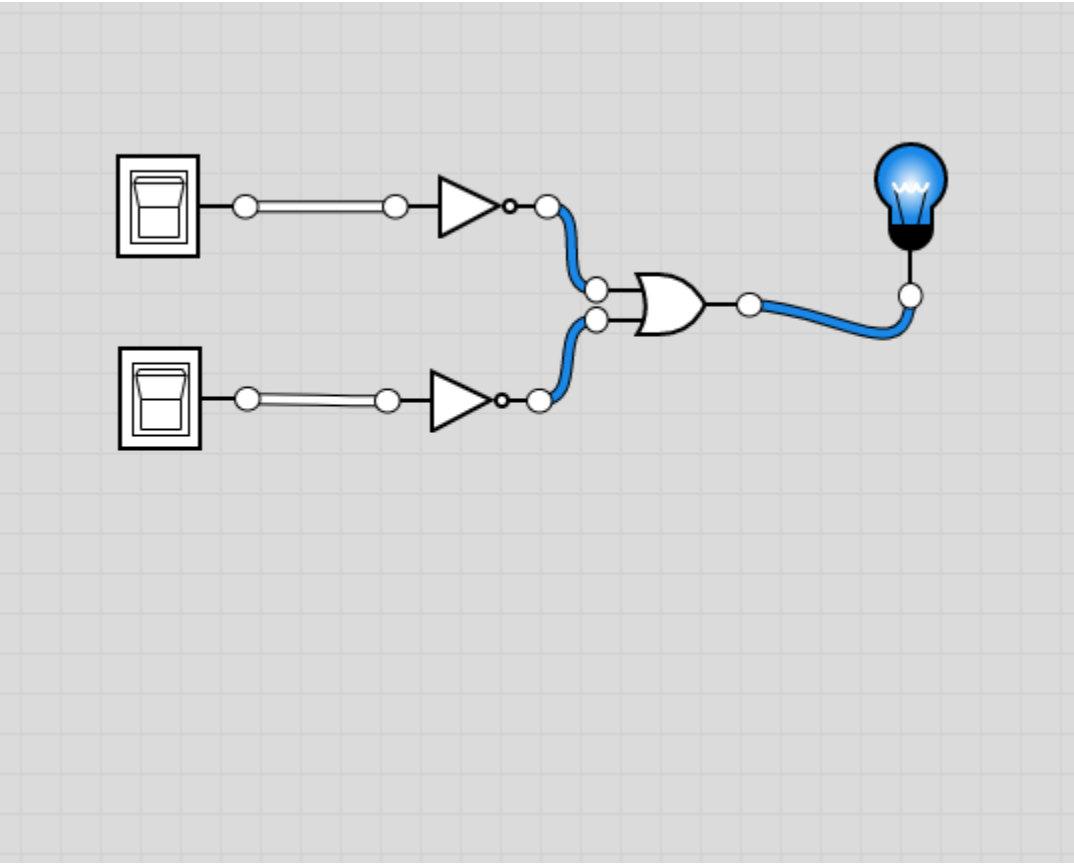


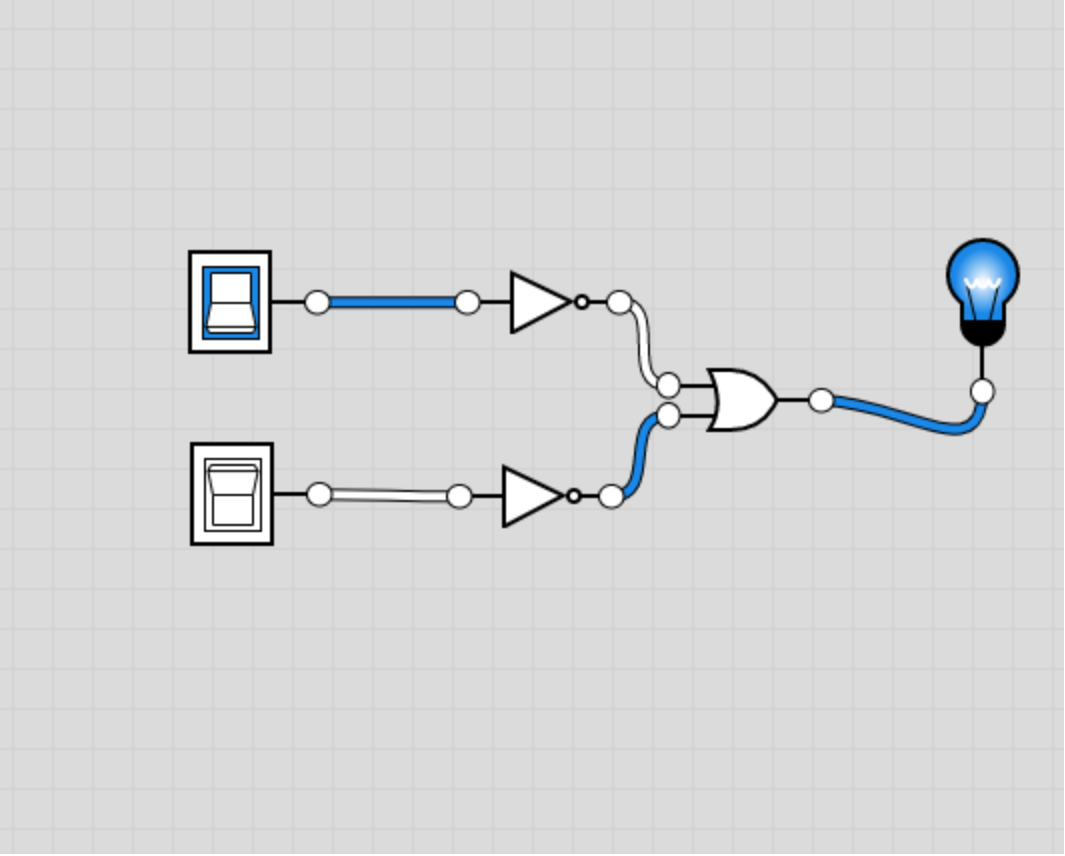
Simplified Output Function

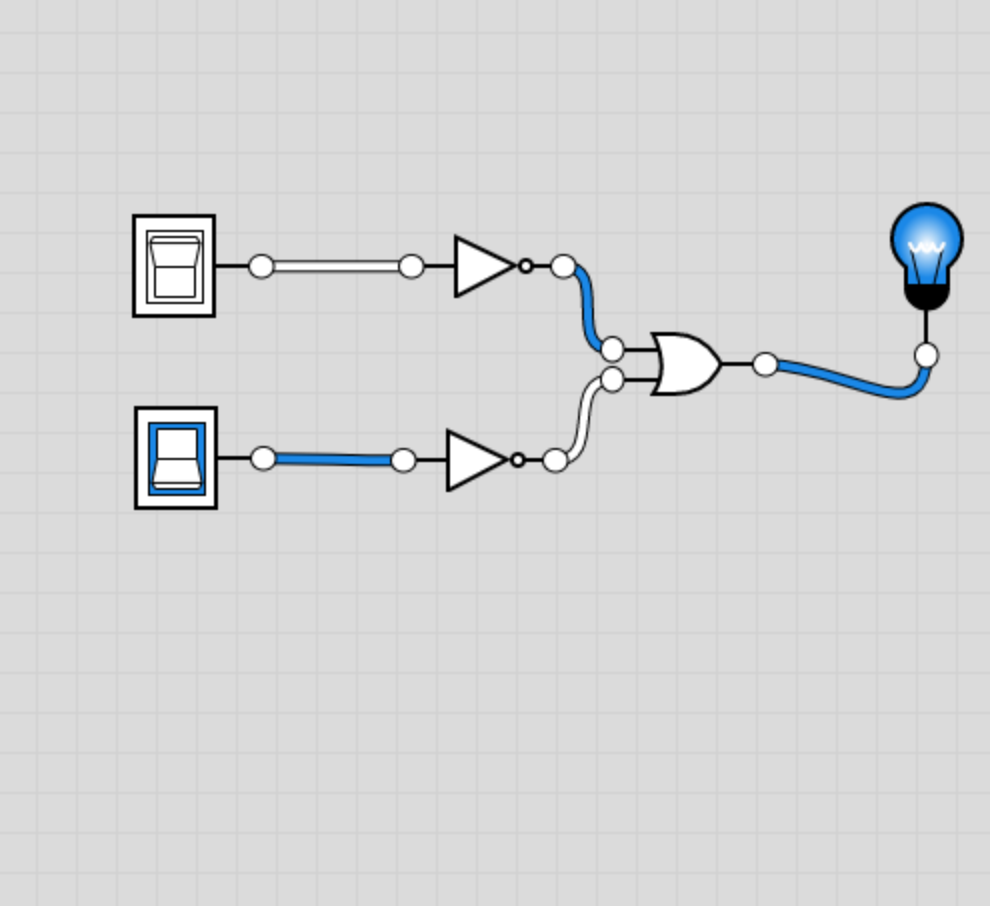
$$F = A' + B'$$

Software Simulation of Logic Circuit From Simplified Function

(Show here your results for each combination that is present in the Boolean expression)



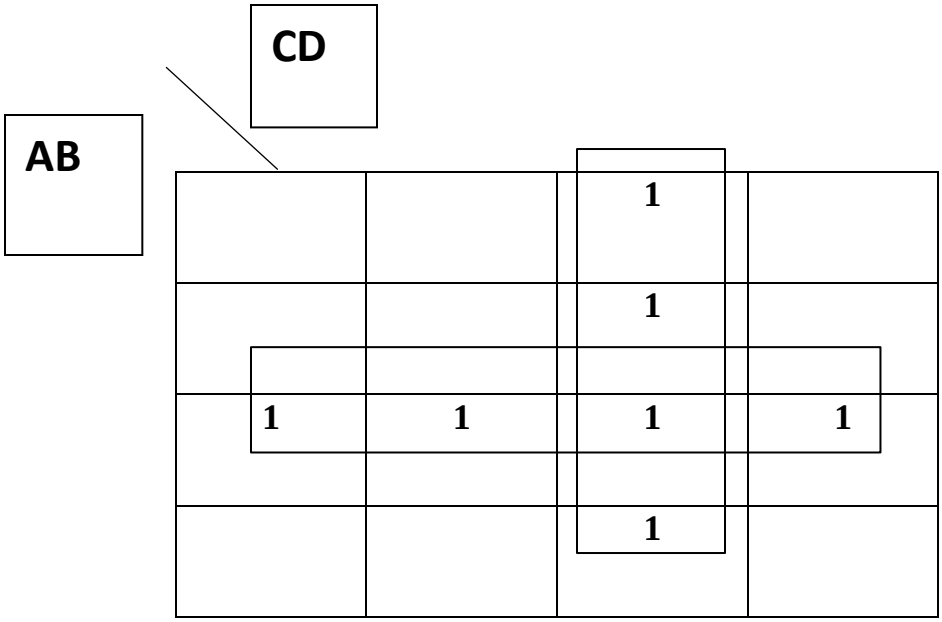




2. **Minimize the following function using K-Map. Verify the output expression with the help of simulation.**

   $f(a,b,c,d) = \sum m(3,7,11,12,13,14,15)$

   K-Map

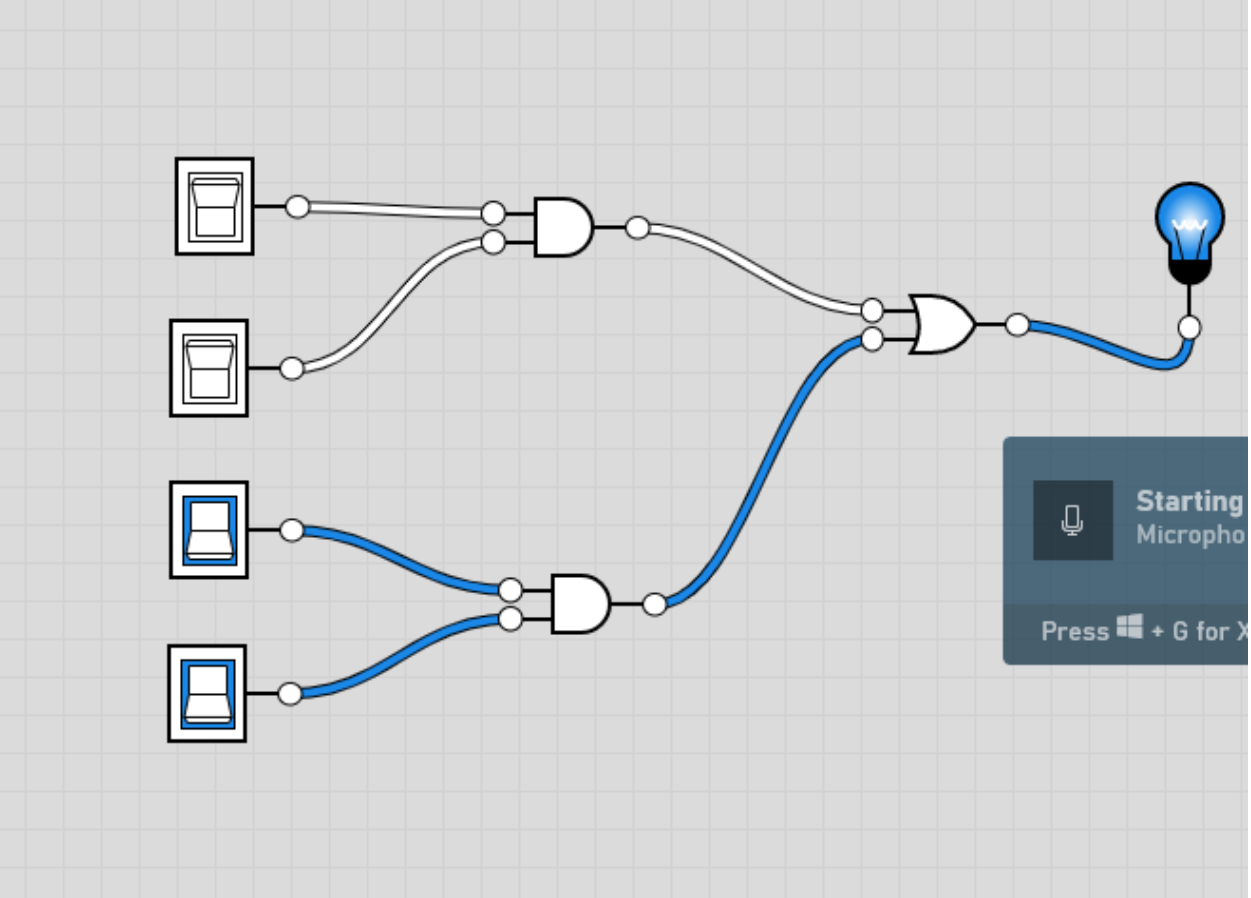


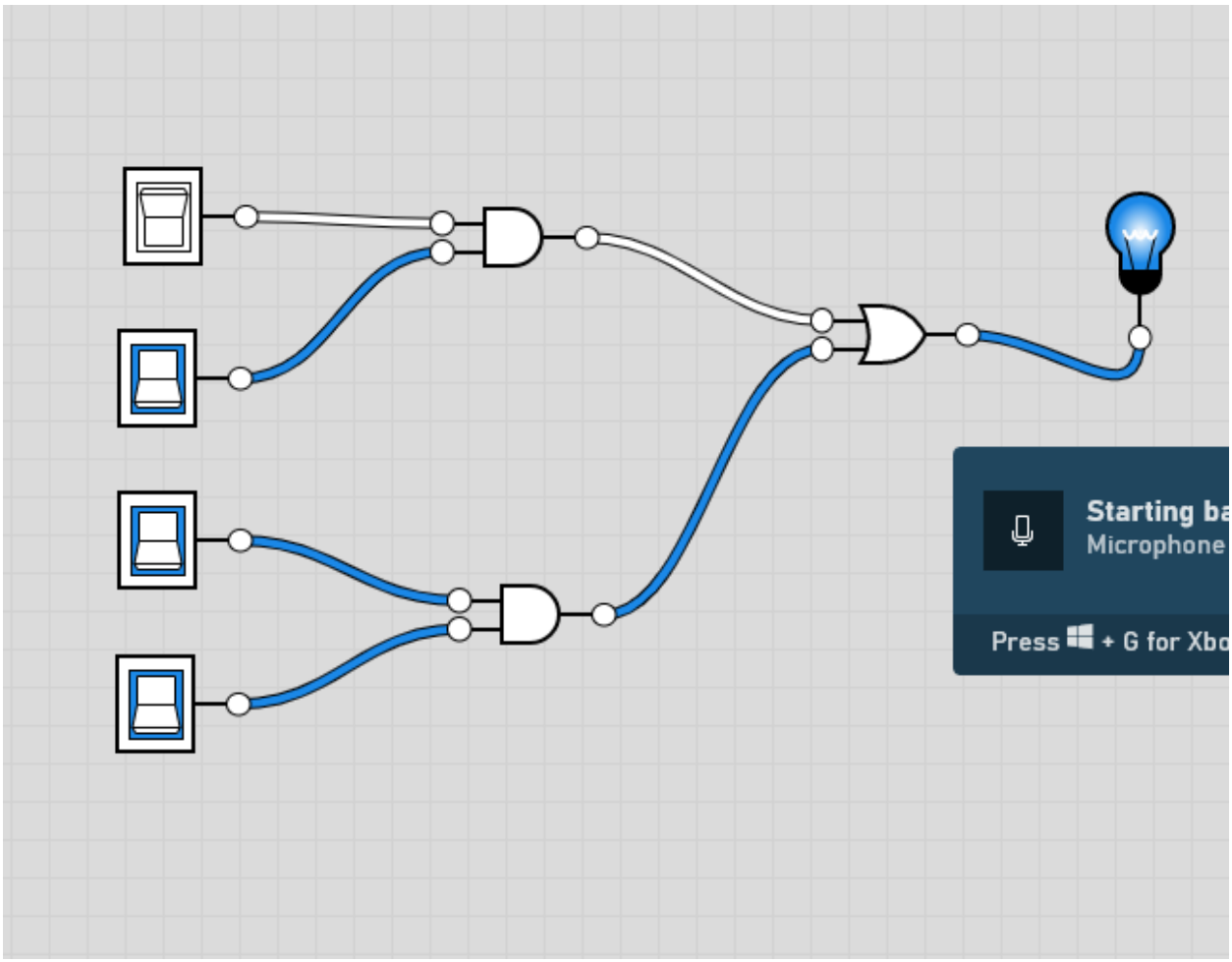
Simplified Output Function

$$F = CD + AB$$

Software Simulation of Logic Circuit From Simplified Function

(Show here your results for each combination that is present in the Boolean expression)


Starting
Microphone
Press + G for X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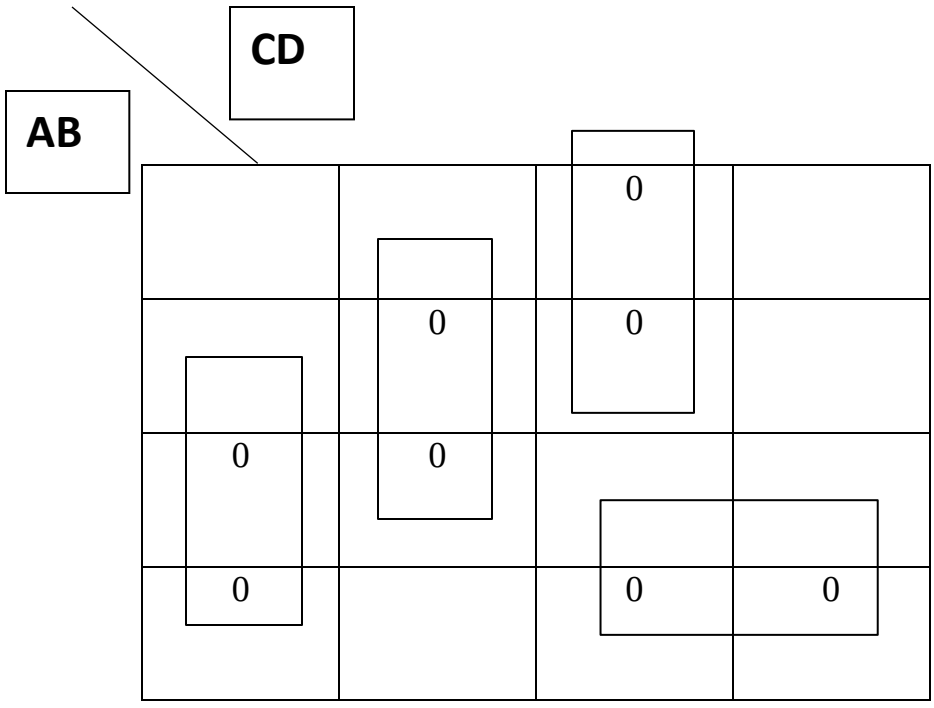
Microphone
Press + G for Xbo

3. Construct K-Map for the given POS form given below. Simulate your final expression (reduced) and show the results.

F(A,B,C,D)=**π**(3,5,7,8,10,11,12,13)

K-Map

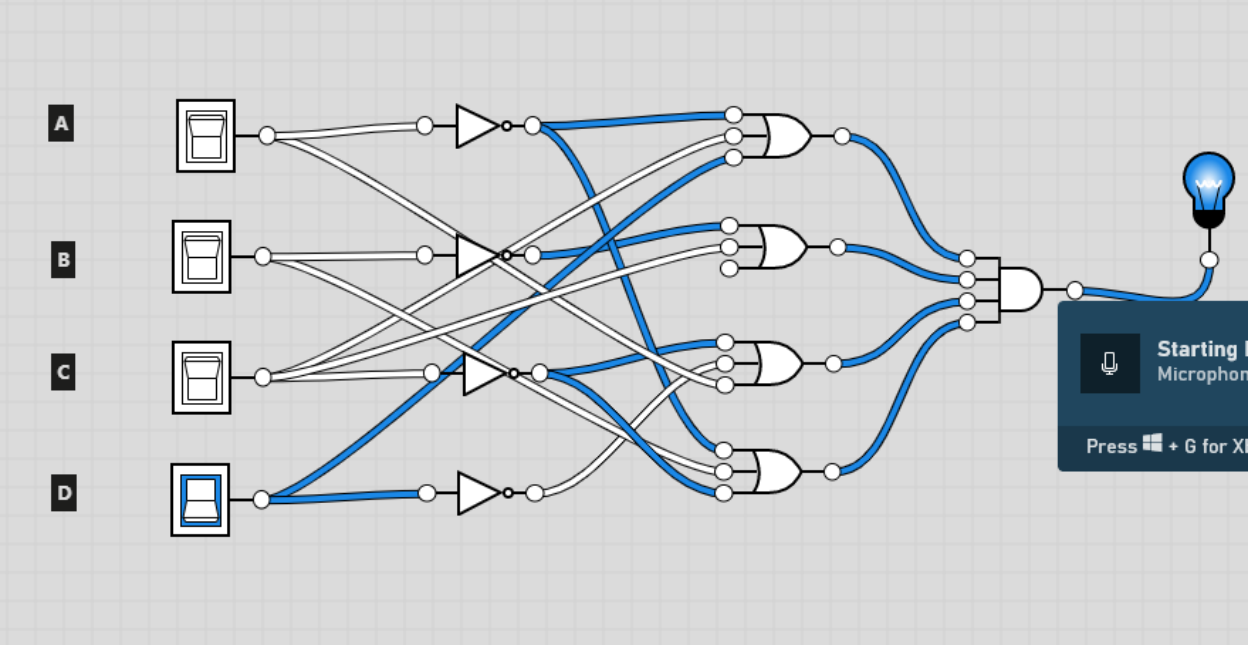


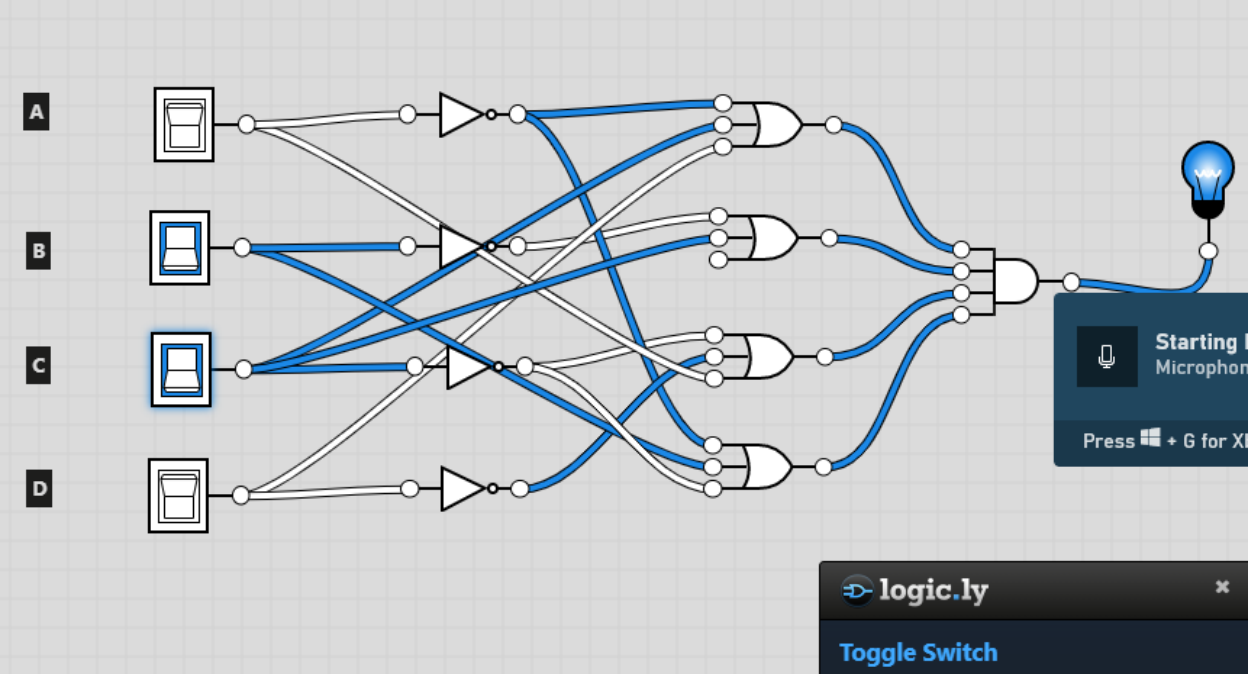
Simplified Output Function

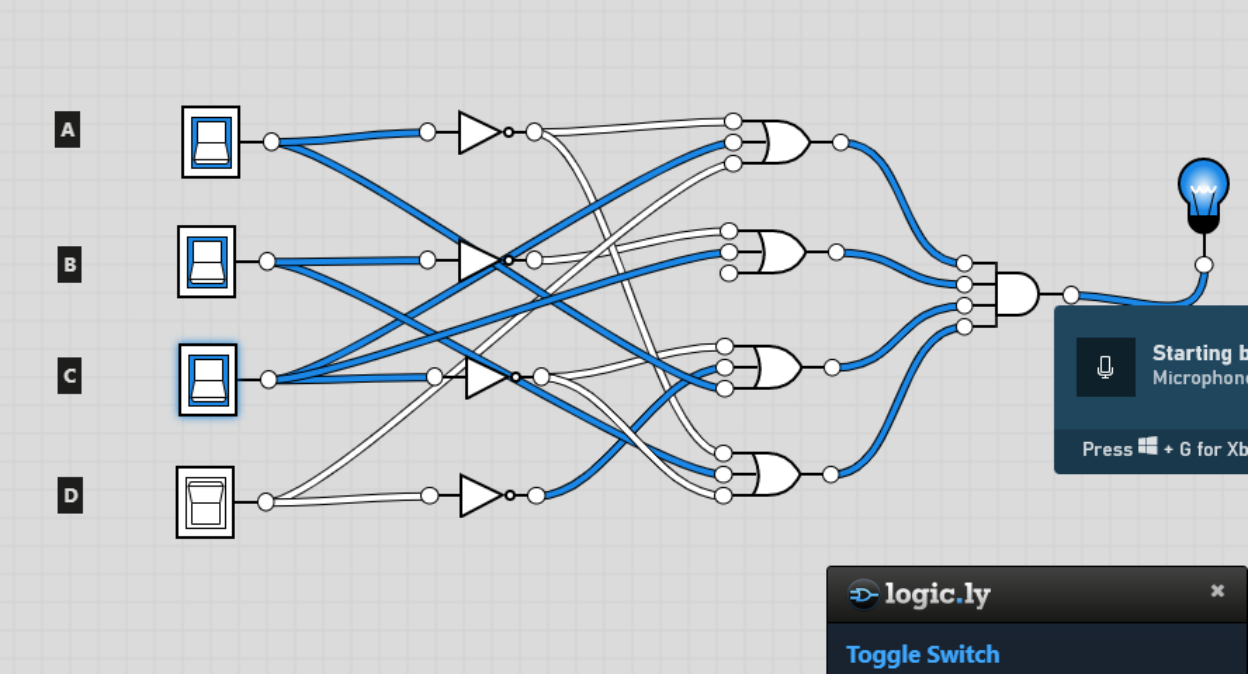
$$F = (C + D + A') . (B' + C + D') . (C' + D' + A) . (A' + B + C')$$

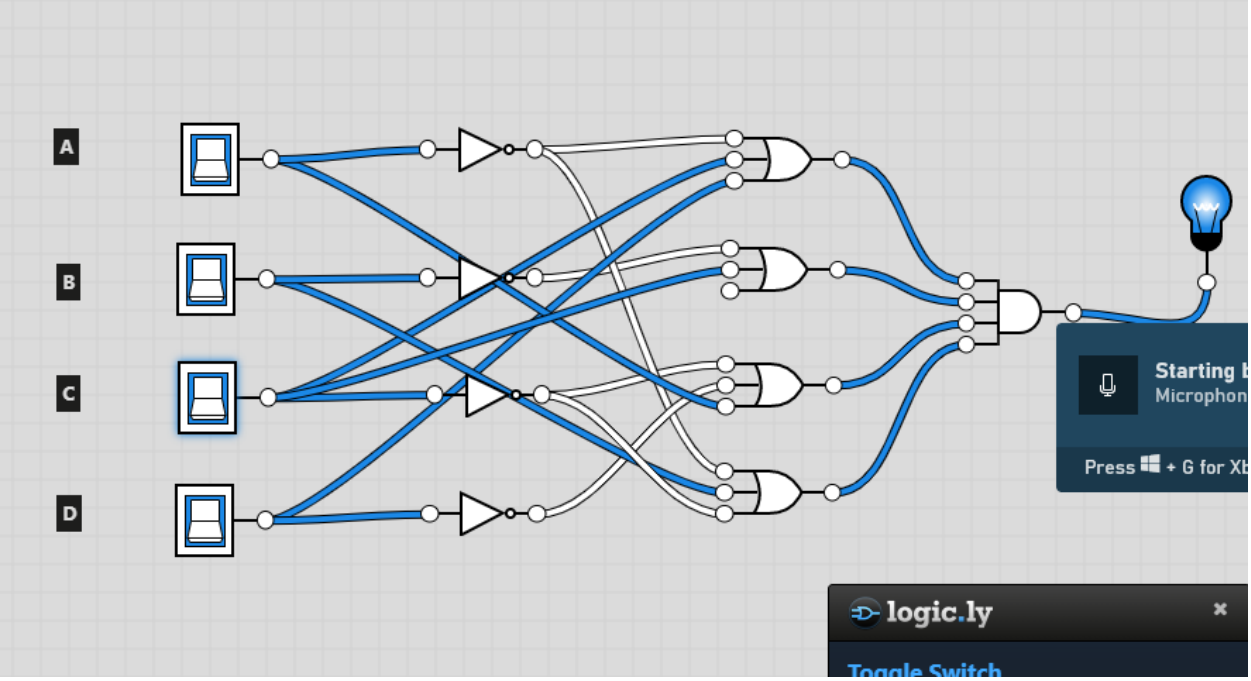
Software Simulation of Logic Circuit From Simplified Function

(Show here your results for each combination that is present in the Boolean expression)




A
B
C
D
logic.ly
Toggle Switch

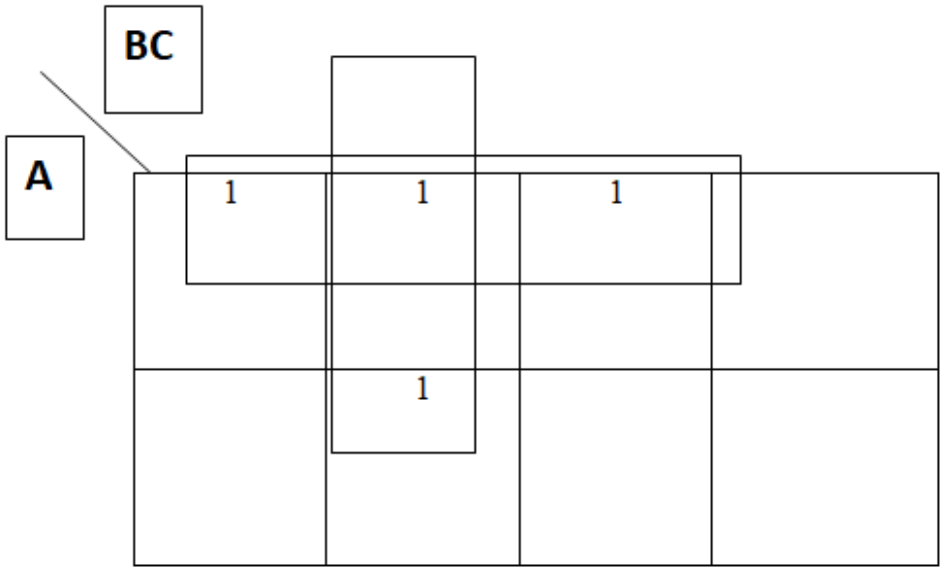

A
B
C
D
logic.ly
Toggle Switch



4. **Devise a minimized expression for the given truth table using K-Map (SOP form).**
   a)

A	B	C	Out
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

KMAP:


BC
A
1
1
1
1

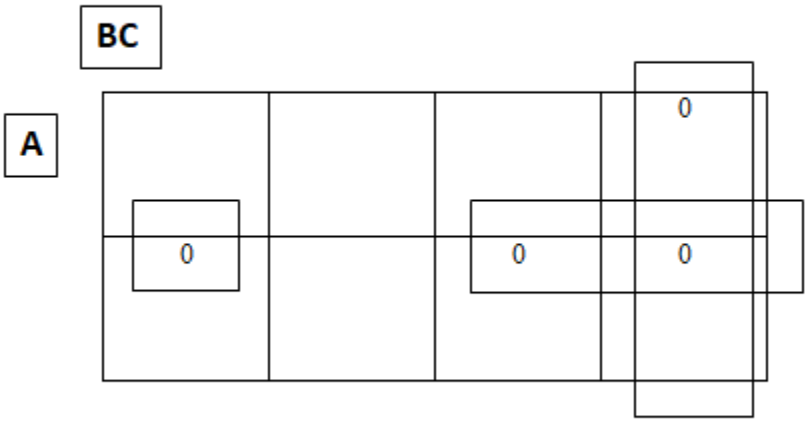
Expression

Out=

$$F = A' + B'C$$

b) For the above truth table, devise an expression in POS form using KMap.

K-Map

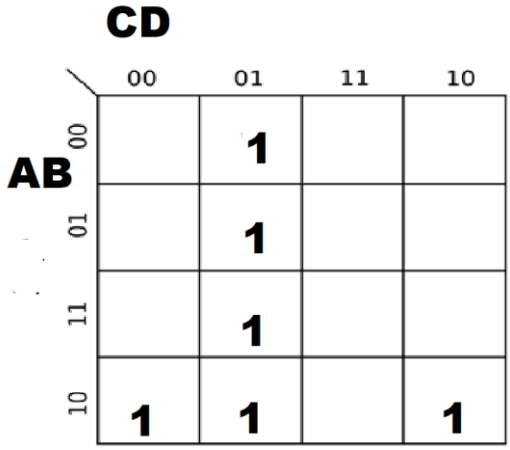


Expression

Out=

$$F = (A'+B+C) \cdot (A'+B') \cdot (B'+C)$$

c) Devise a truth table and Boolean expression for the given K-Map.



Truth Table

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

Expression

F = (A'B'C'D) + (A'BC'D) + (AB'C'D') + (AB'C'D) + (AB'CD')