

Lab 4

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

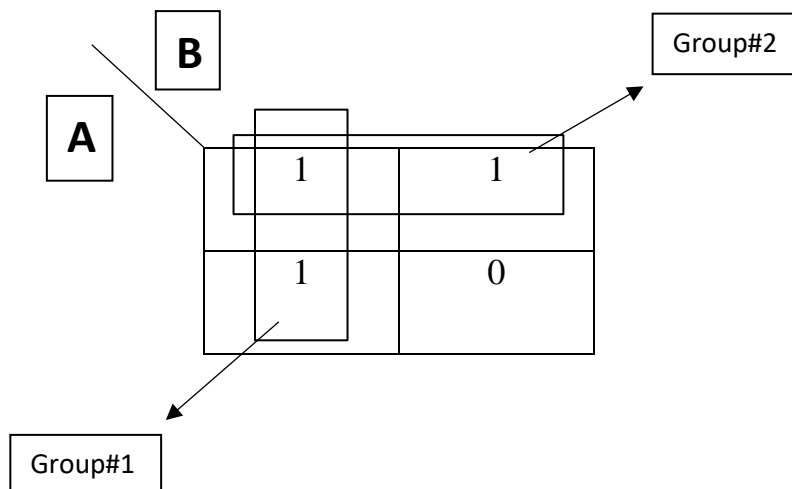
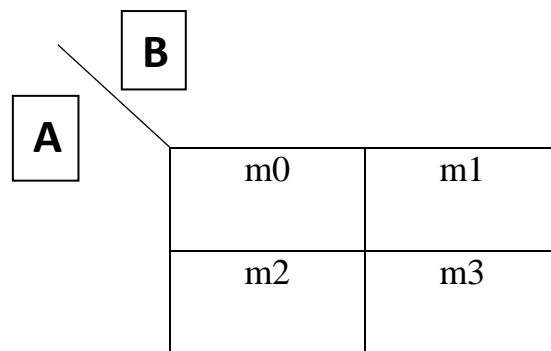
Note: For examples, refer to the following link: <https://www.geeksforgeeks.org/introduction-of-k-map-karnaugh-map>

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

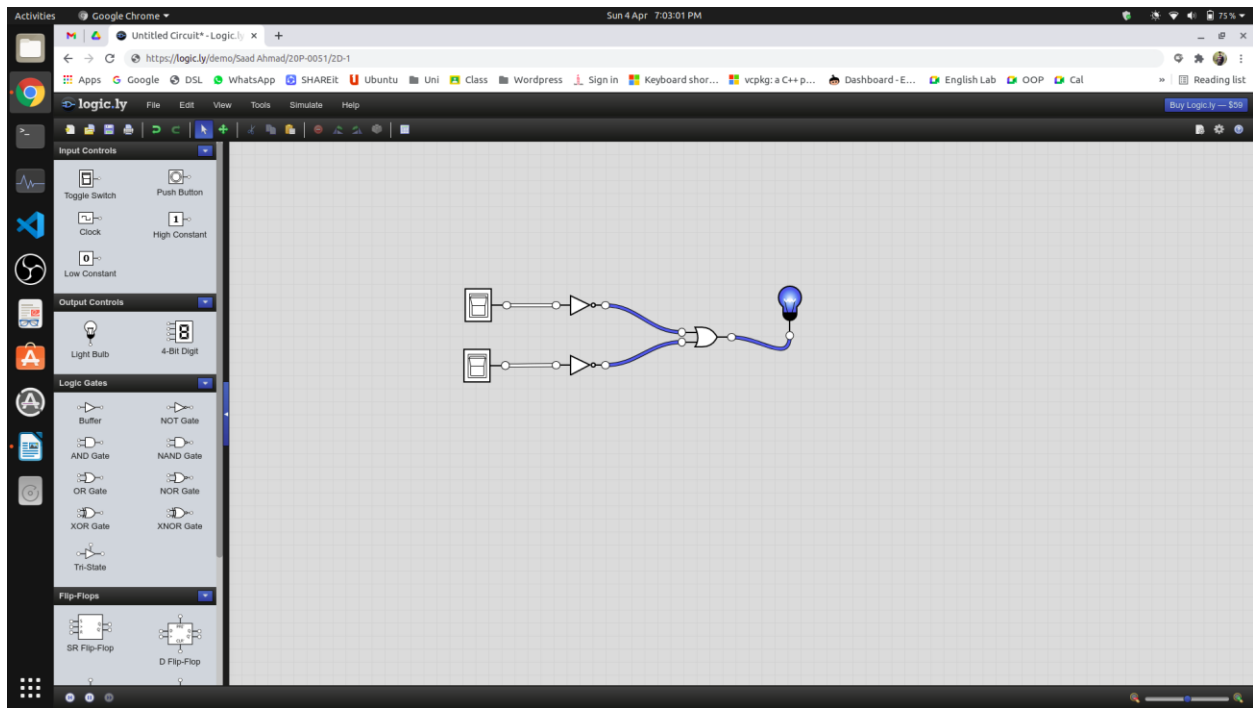


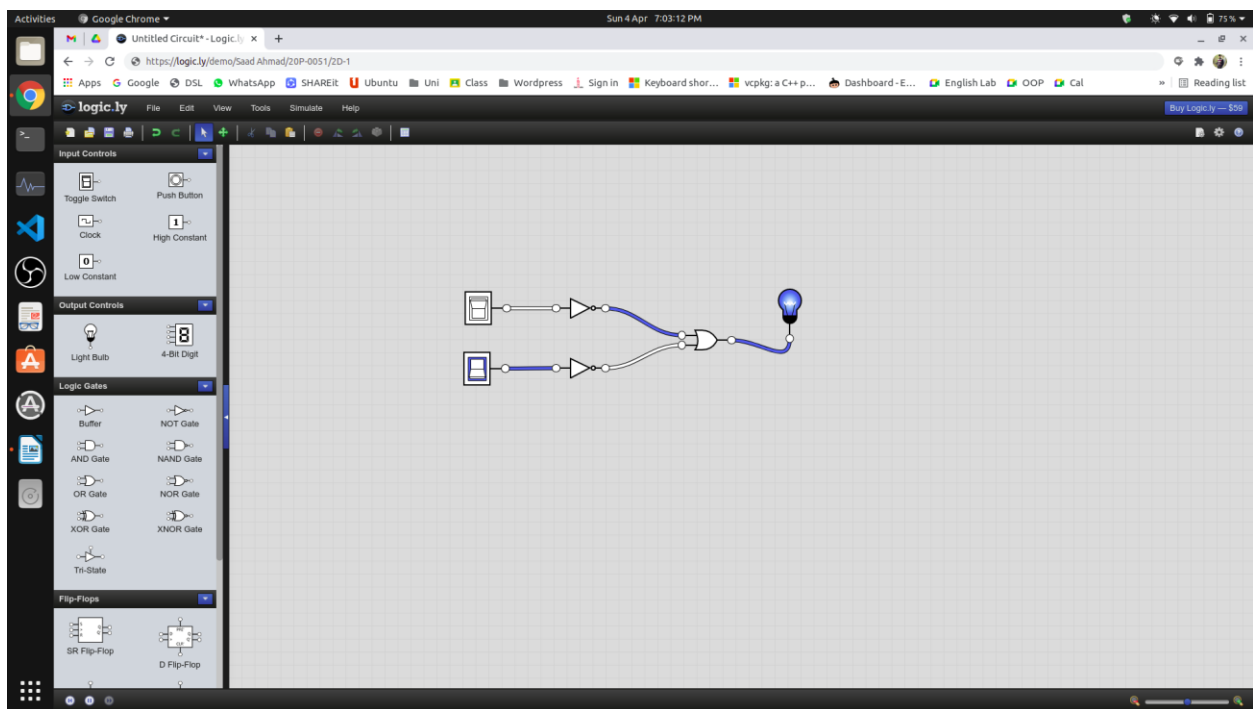
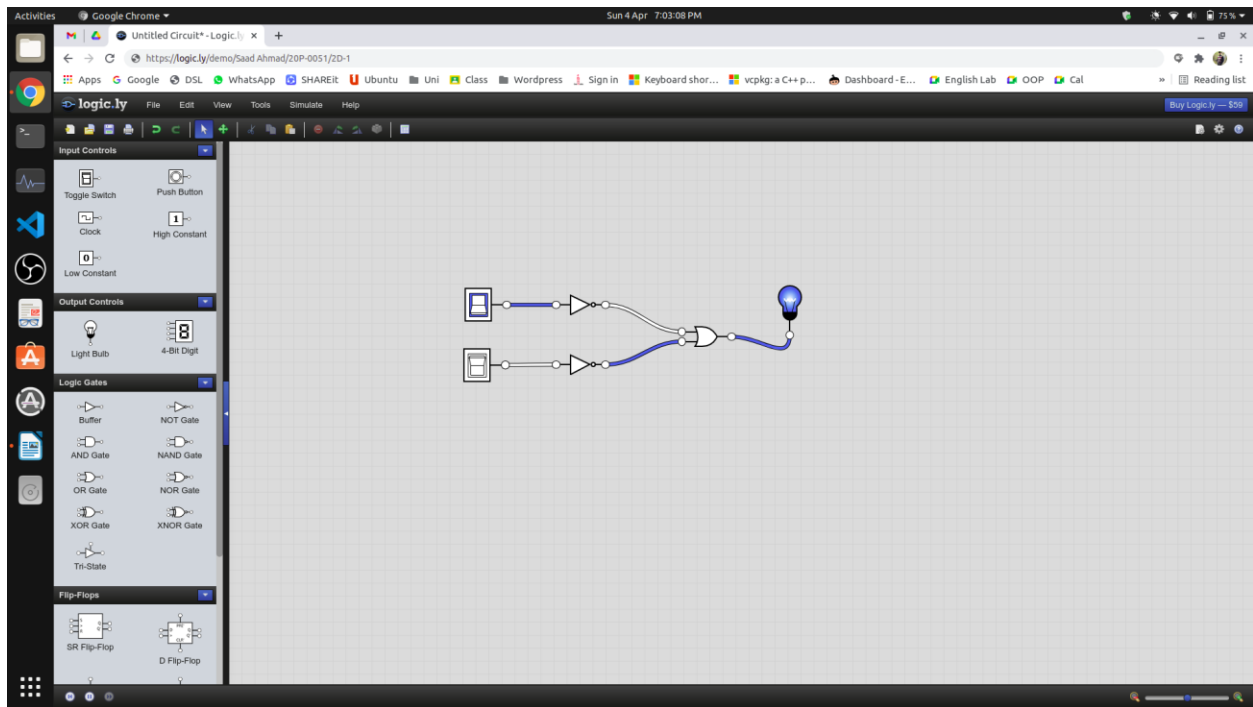
Simplified Output Function

$$F = A' + B'$$

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

AB	CD			
	m0	m1	m3	m2
	m4	m5	m7	m6
	m12	m13	m15	m14
	m8	m9	m11	m10

AB	CD			
			1	
			1	
	1	1	1	1
			1	

Group#1

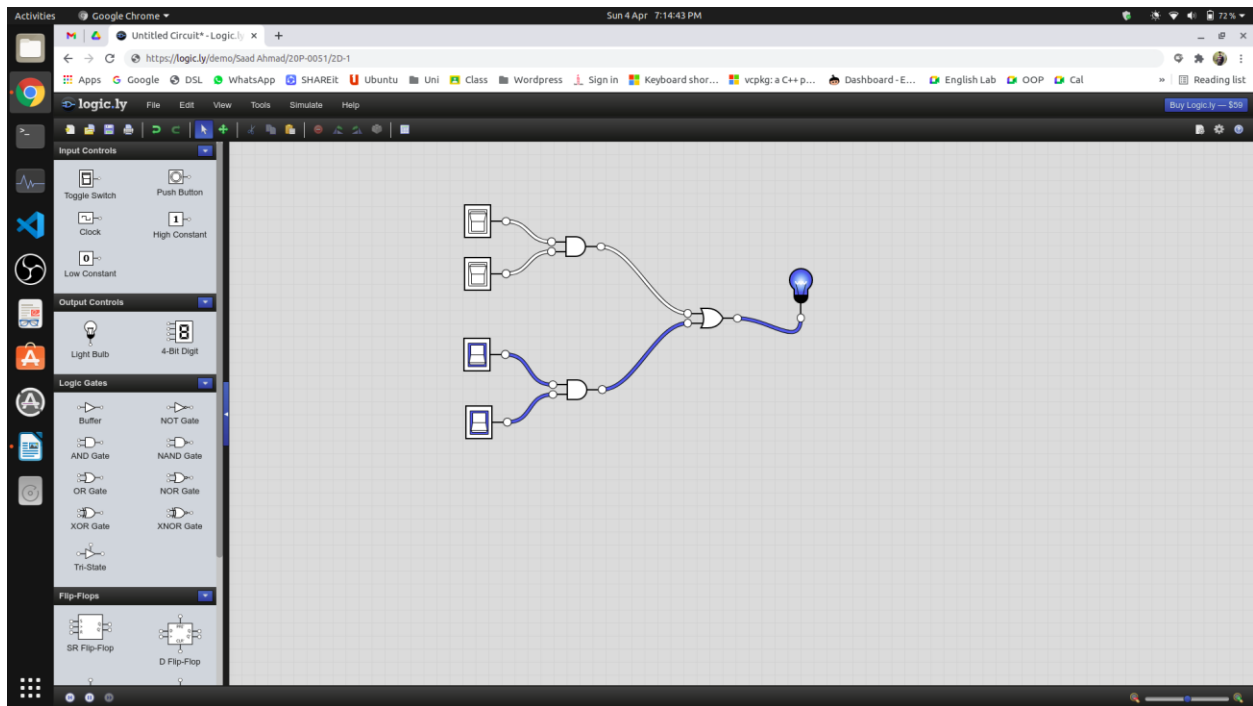
Group#2

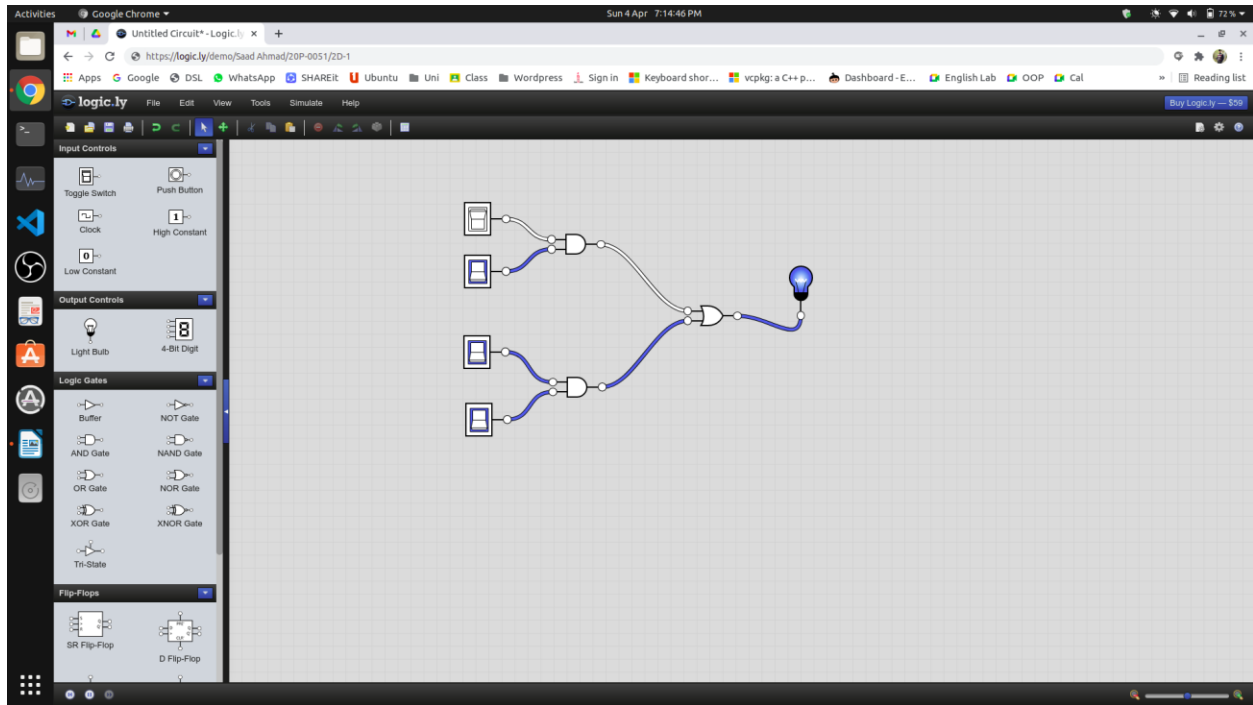
Simplified Output Function

$$F = CD + AB$$

Software Simulation of Logic Circuit From Simplified Function

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



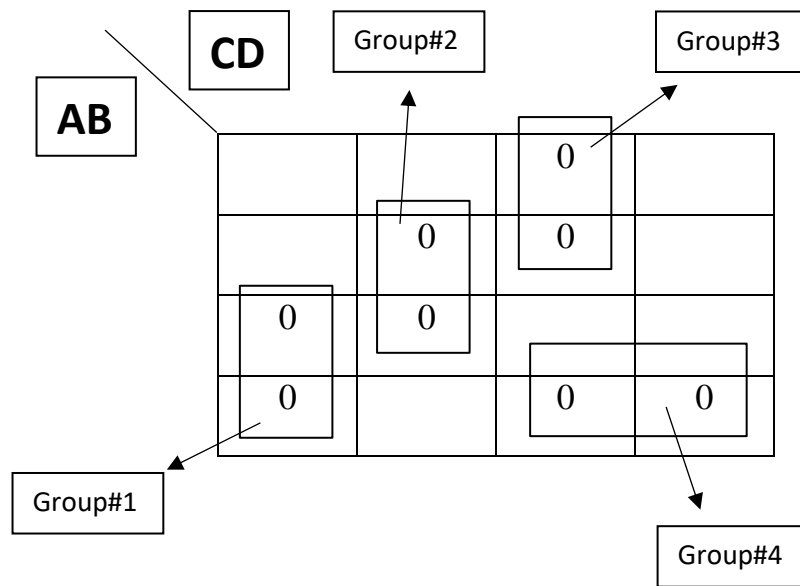


3. Construct K-Map for the given POS form given below. Simulate your final expression (reduced) and show the results.

$$F(A,B,C,D)=\pi(3,5,7,8,10,11,12,13)$$

K-Map

AB	CD			
	M0	M1	M3	M2
	M4	M5	M7	M6
	M12	M13	M15	M14
	M8	M9	M11	M10

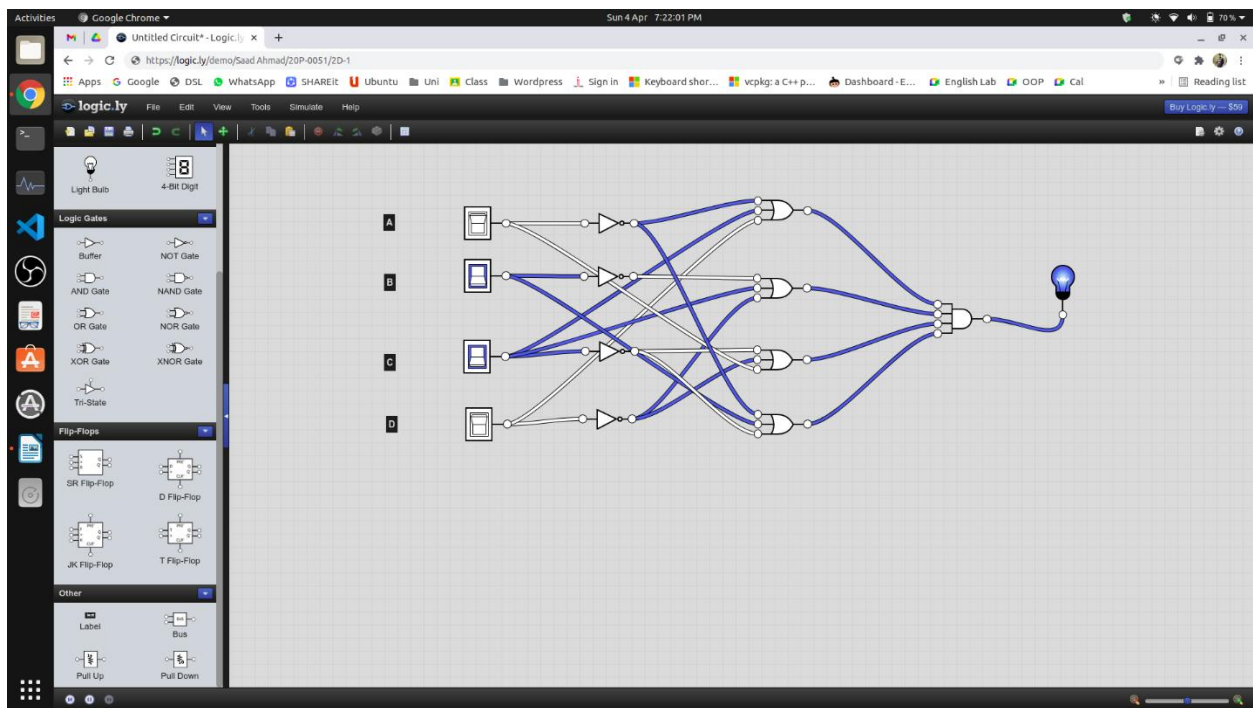
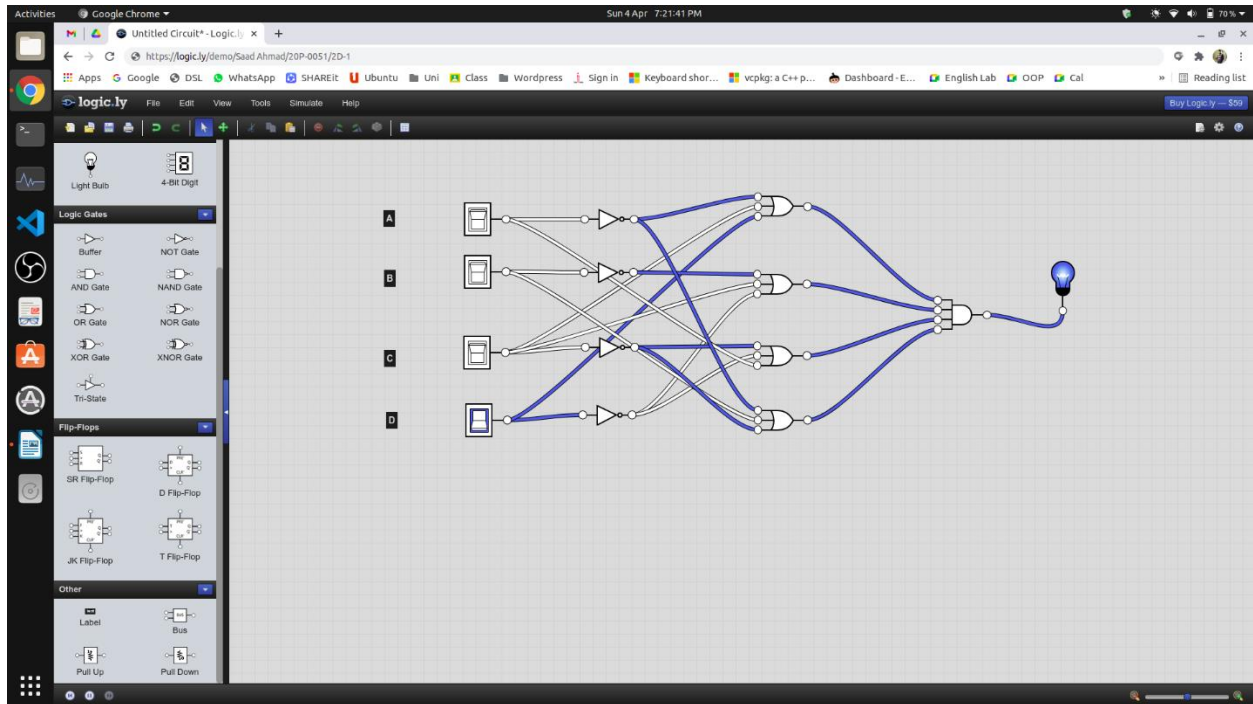


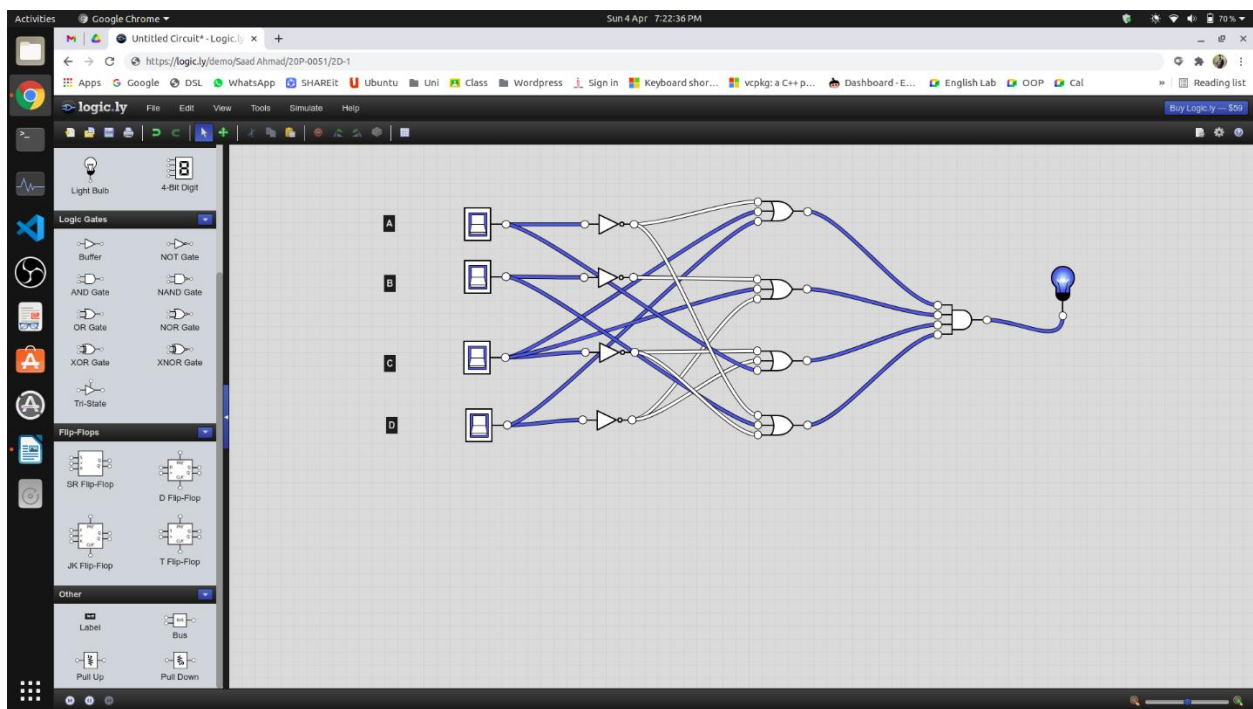
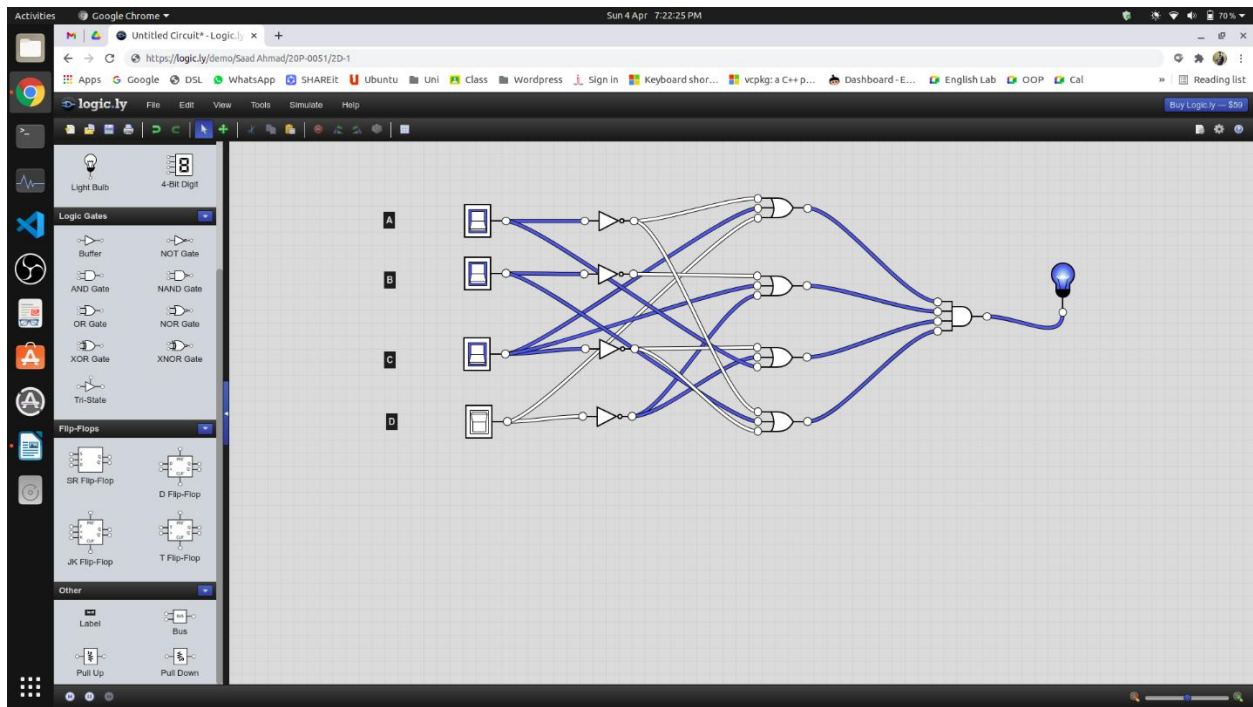
Simplified Output Function

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

Software Simulation of Logic Circuit From Simplified Function

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





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

K-Map

A	BC			
	m0	m1	m3	m2
	m4	m5	m7	m6

A	BC			
	1	1	1	
		1		

Group#1 points to the top row (m0, m1, m3).

Group#2 points to the middle cell (m5).

Expression

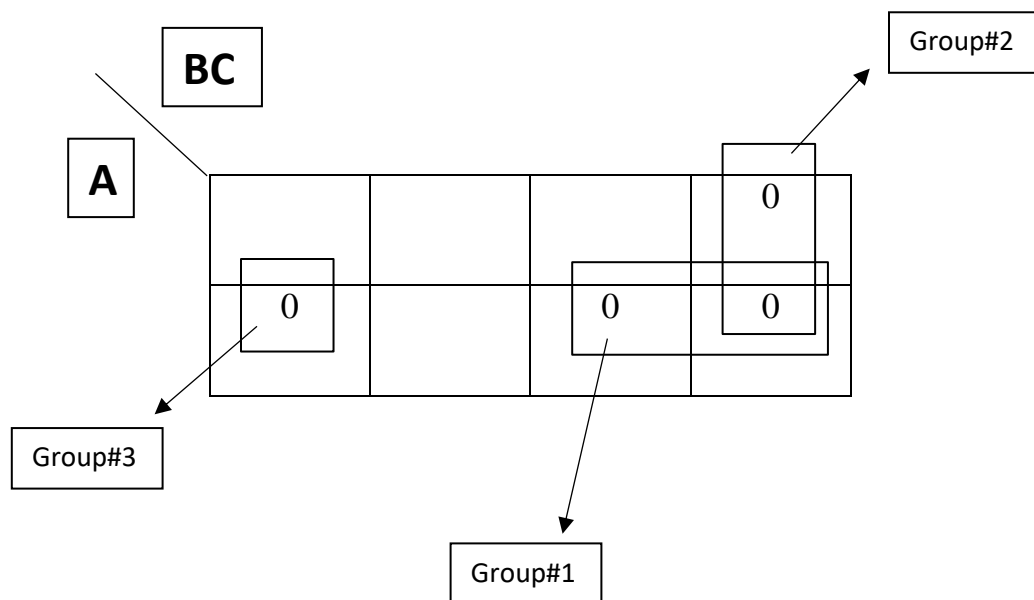
Out=

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

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

K-Map

A	BC			
	m0	m1	m3	m2
	m4	m5	m7	m6



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.

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

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

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