Name: Adri Saha
ID : 2019-1-60-024
Sub :

Pre-lab Report : 02

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* The circuit produces a high (logic 1) output only when the binary number is greater than 0101_2. Input : A, B, C, D. Output : F.

1. Prepare a truth table for the given combinational circuit.

A	B	C	D	F(output)
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
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	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

Truth table for given combinational circuit

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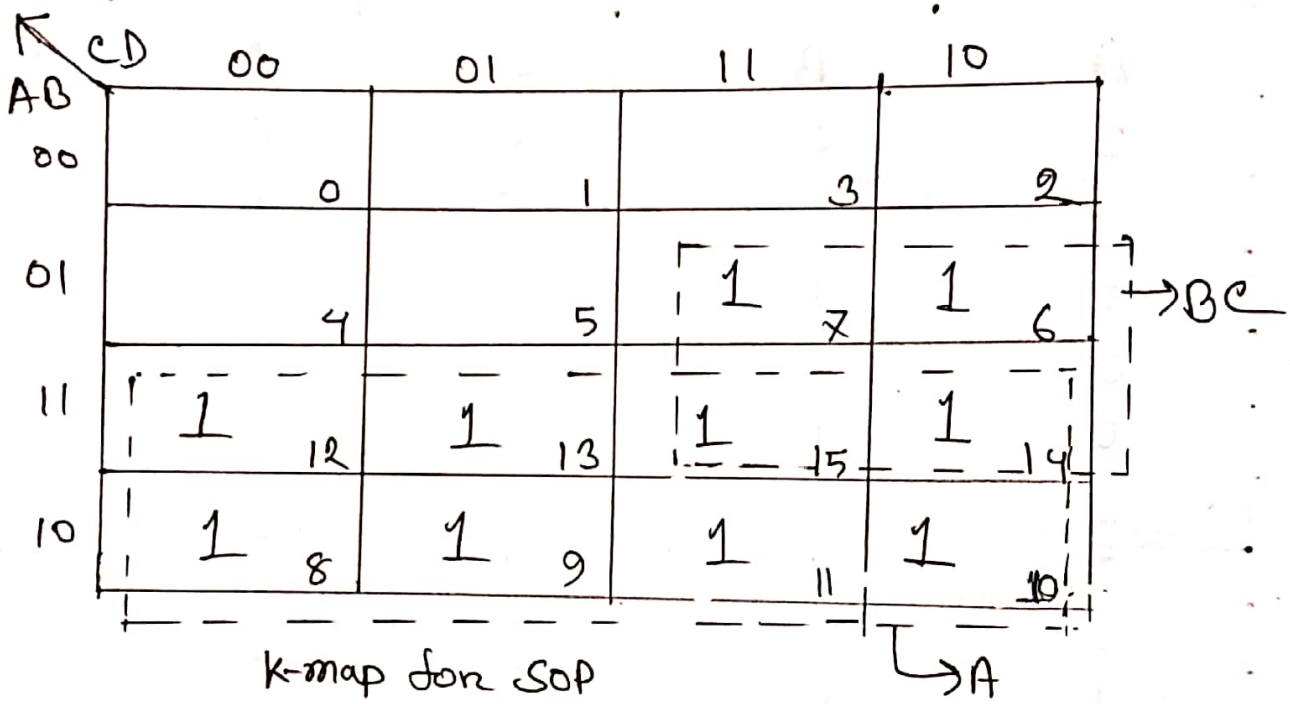
2. Write a simplified sum of products function from the k-map.

The sum of product function is:

$$F_1(A,B,C,D) = \Sigma(7,8,9,10,11,12,13,14,15)$$



K-map for SOP

So, the simplified SOP function's expression is = $A + BC$; [cost = 2+4 = 6]

Now, the AND-OR logic diagram for the simplified SOP function are given below:

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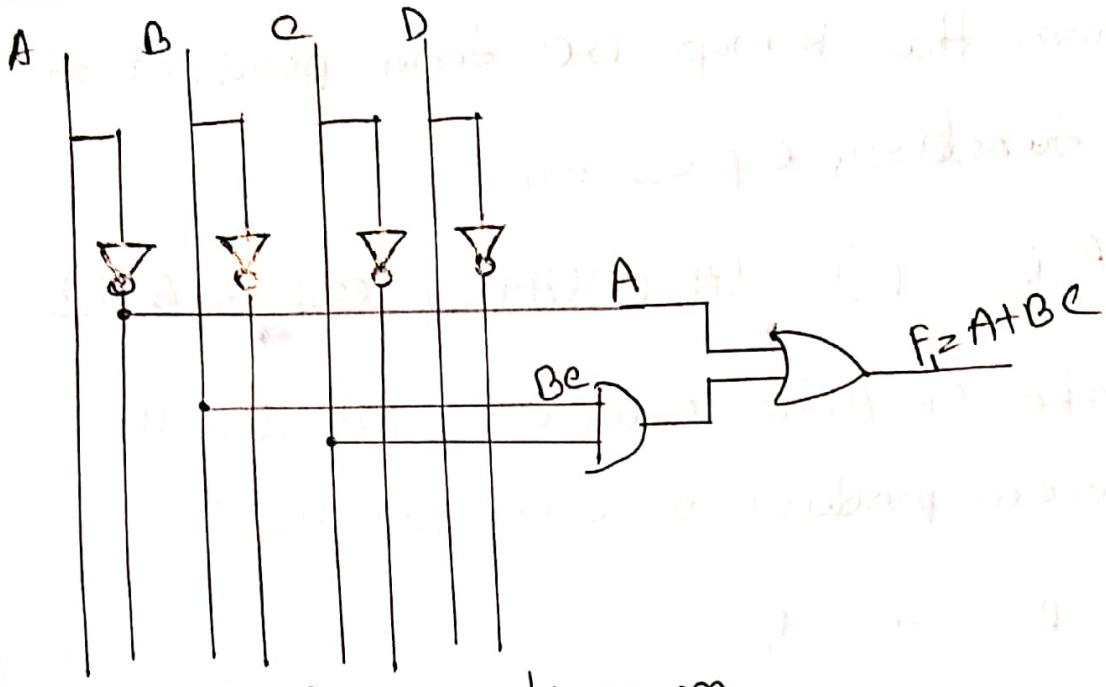

AND-OR logic diagram

3. Write simplified product of sums function from the k-map.

The product of sums (POS) function is:

$F_2(A,B,C,D) = \pi(0,1,2,3,4,5)$

AB \ CD	00	01	11	10	
00	0 (0)	0 (1)	0 (3)	0 (2)	→ (A+B)
(A+C) 01	0 (4)	0 (5)	(7)	(6)	
11	(12)	(13)	(15)	(14)	
10	(8)	(9)	(11)	(10)	

k-map for POS

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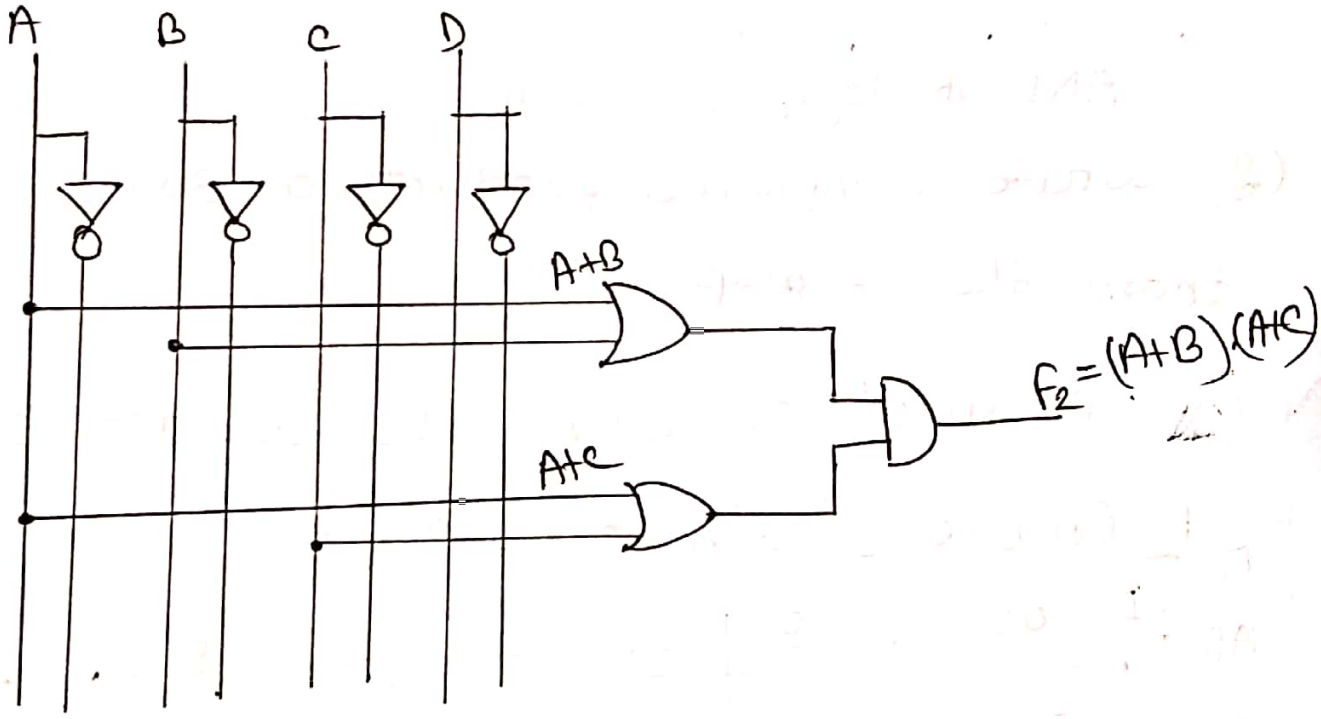
So, from this k-map we find product of sum function's expression:

$F_2(A,B,C,D) = (A+B)(A+C)$ [cost = 3+6 = 9]

Now, the OR-AND logic diagram for the simplified product of sum function:



OR-AND logic diagram

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