Siddhi Singh

17BIT0028

Lab 3

Exp- 3.

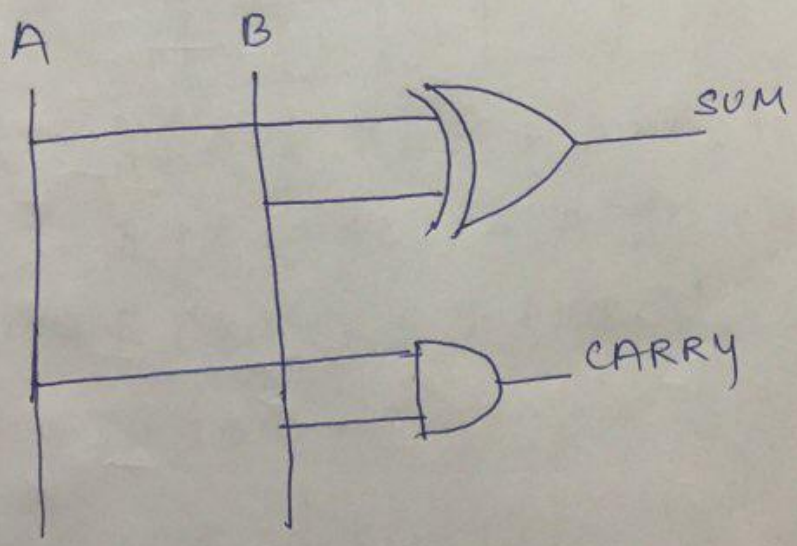
ADDERS

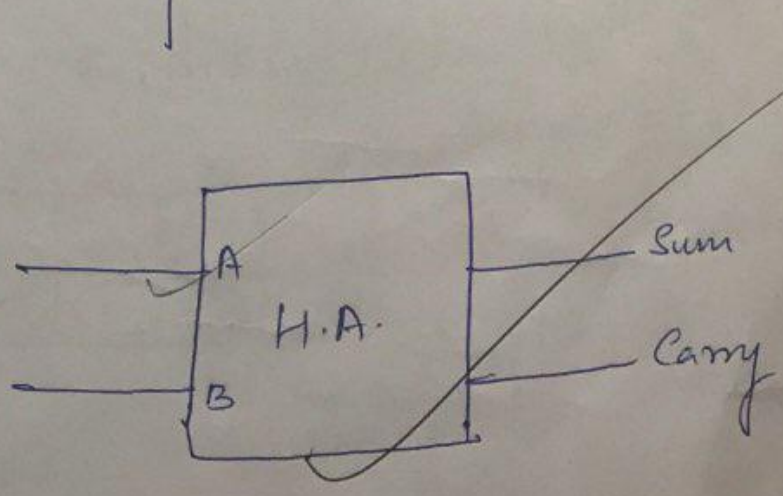
HALF ADDER

A	B	Carry	Sum
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

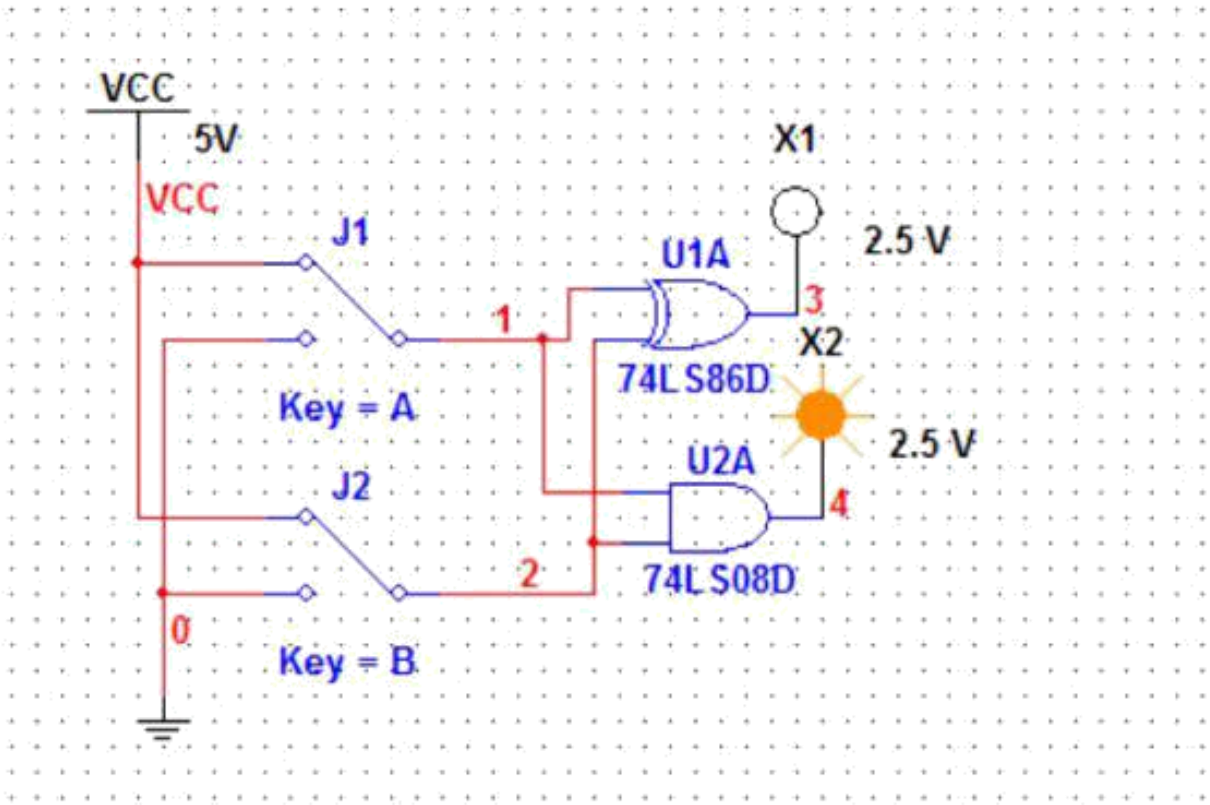
$$SUM = \bar{A}B + A\bar{B}$$
$$= A \oplus B$$

$$CARRY = AB$$





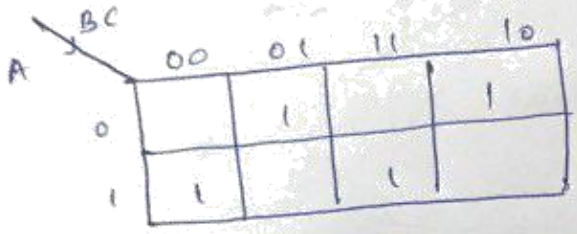
1) HALF ADDER



FULL ADDER

A	B	CARRY IN	CARRY OUT	SUM
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

SUM :- $\Sigma(1, 2, 4, 7)$



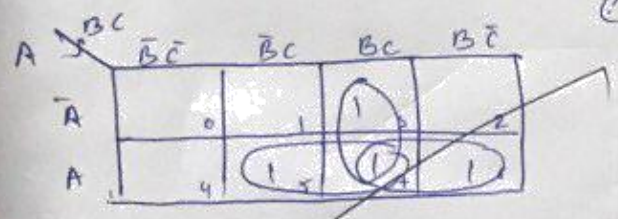
$$SUM = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$

$$= \bar{A}(\bar{B}C + B\bar{C}) + A(\bar{B}C + BC)$$

$$= \bar{A}(B \oplus C) + A(B \oplus C)'$$

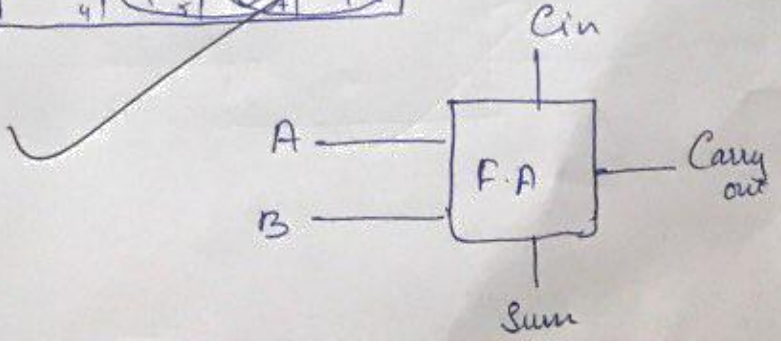
$$= A \oplus B \oplus C$$

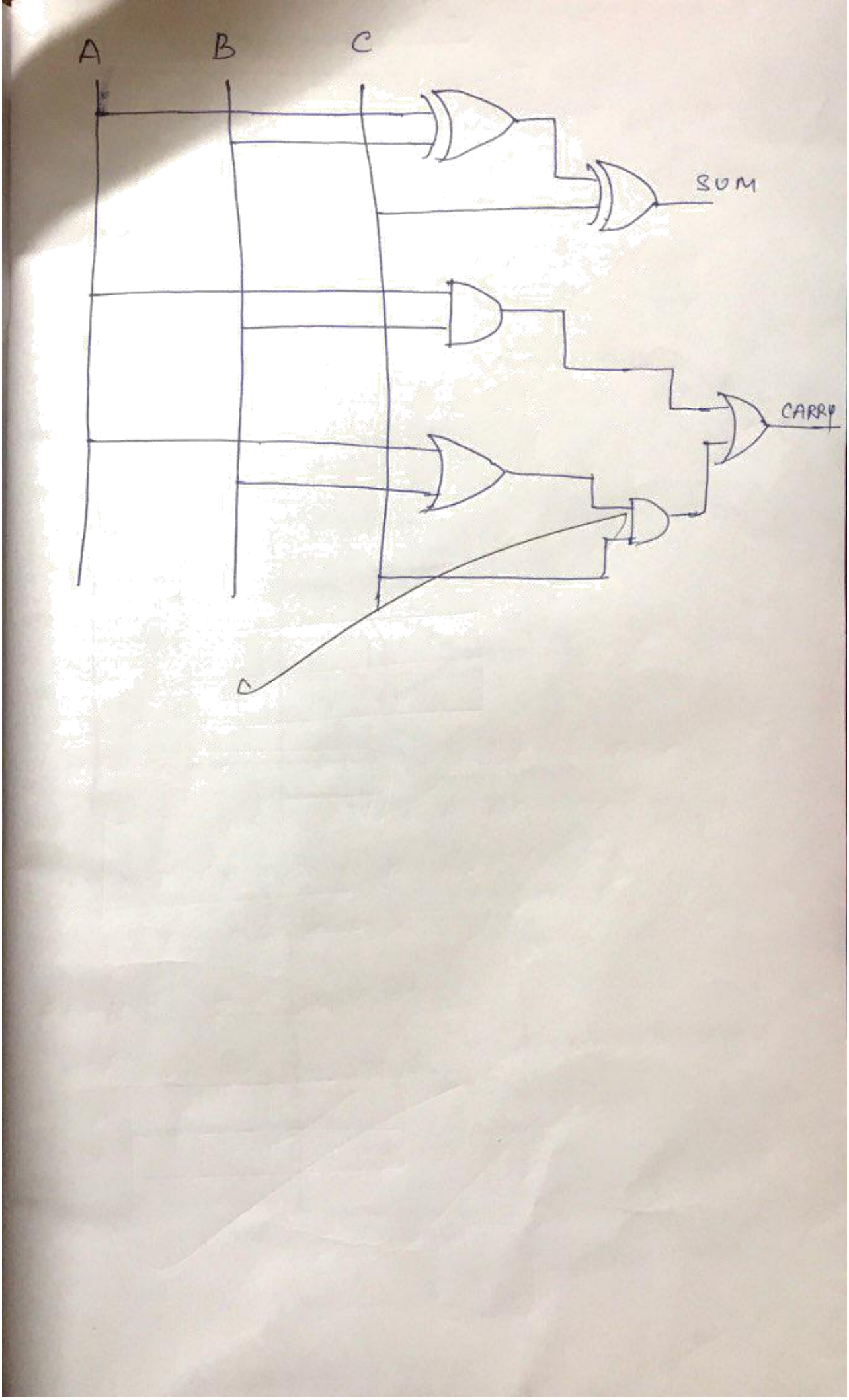
CARRY :- $\Sigma(3, 5, 6, 7)$



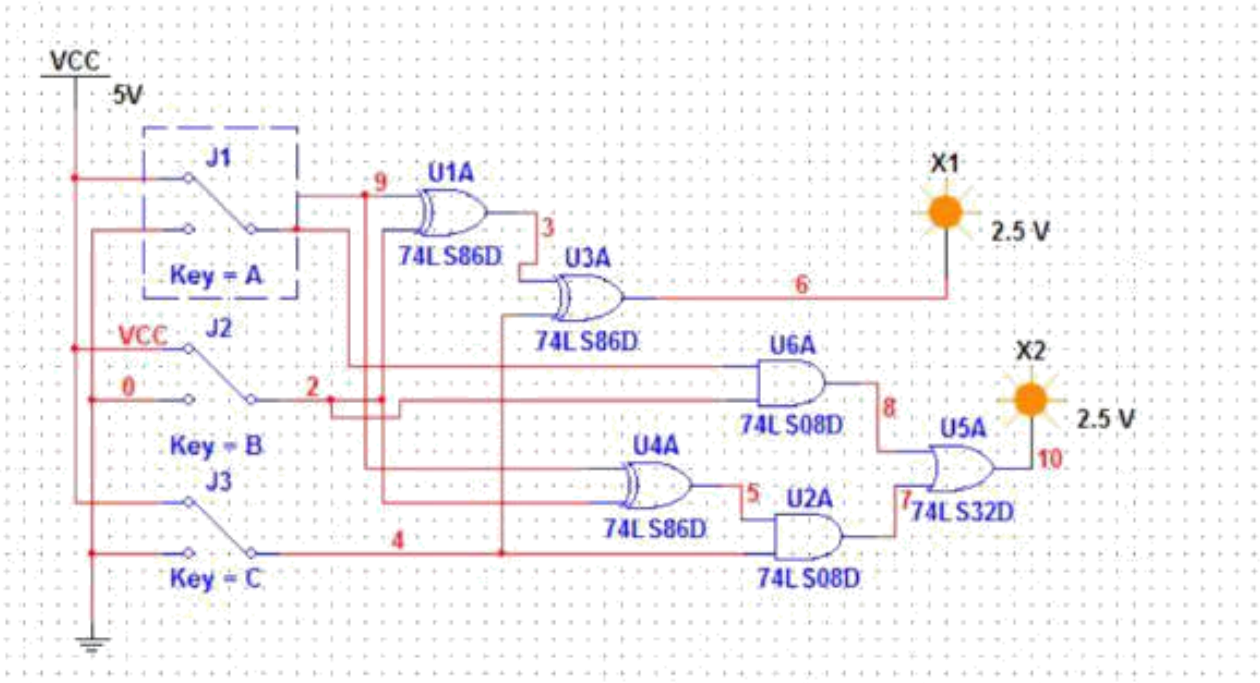
Carry = $AC + BC + AB$

$= C(A + B) + AB$





2) FULL ADDER



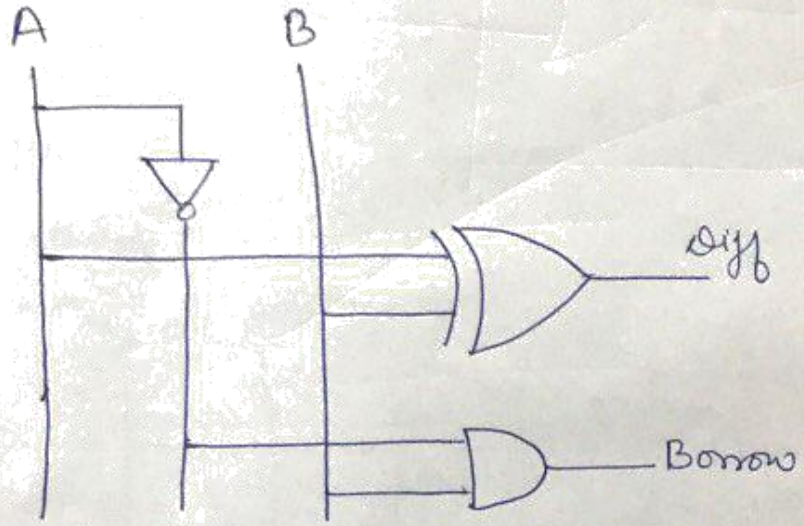
HALF SUBTRACTOR

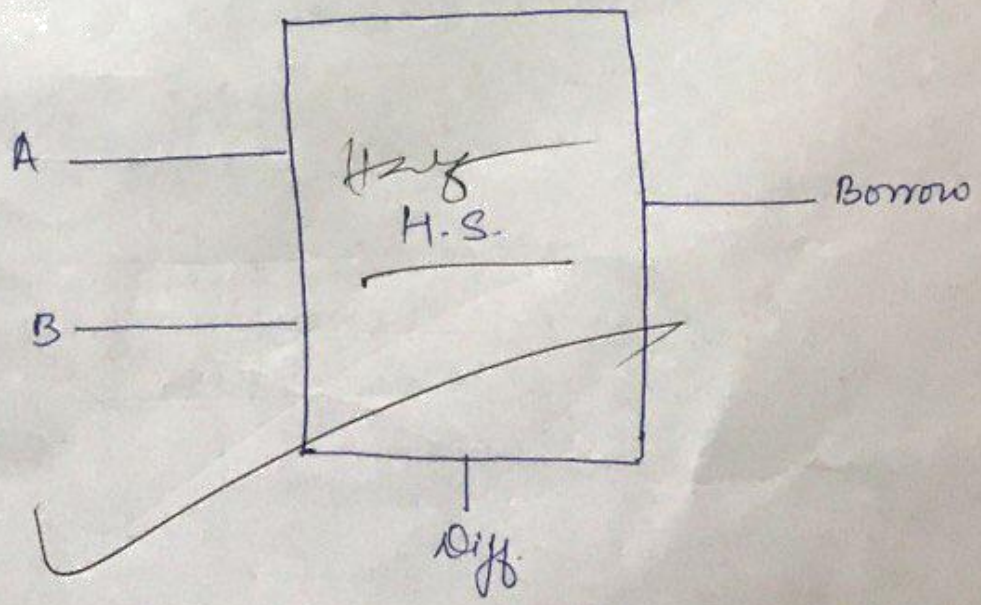
A	B	Borrow	Diff
0	0	0	0
0	1	1	1
1	0	0	1
1	1	0	0

$Diff = \bar{A}B + A\bar{B}$

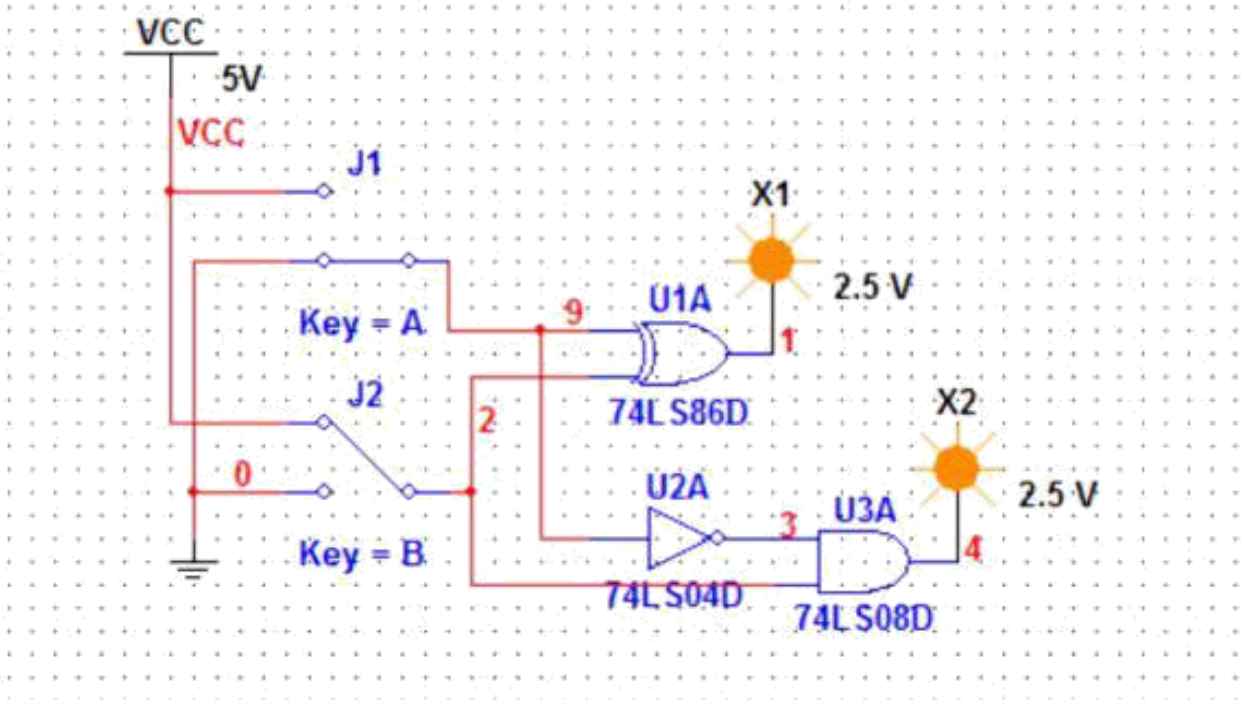
$= A \oplus B$

$Borrow = \bar{A}B$





3) HALF SUBTRACTOR

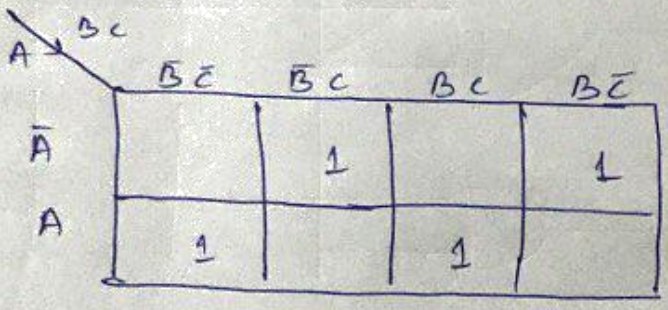


FULL SUBTRACTOR

A	B	C (Borrow in)	Borrow (out)	Diff
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

Diff :- $\bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}C + ABC$

$= \Sigma(1, 2, 4, 7)$



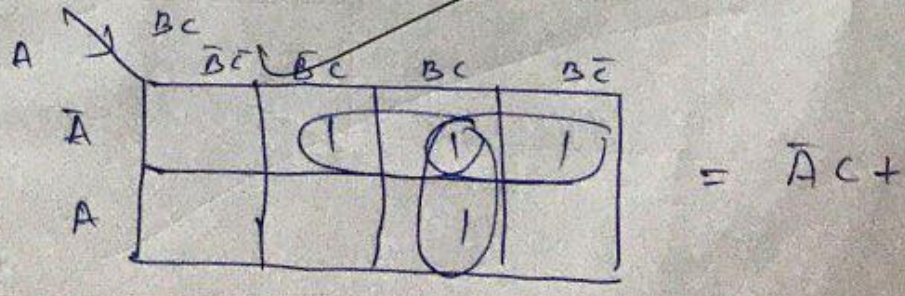
$= \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$

$= \bar{A}\{\bar{B}C + B\bar{C}\} + A\{\bar{B}\bar{C} + BC\}$

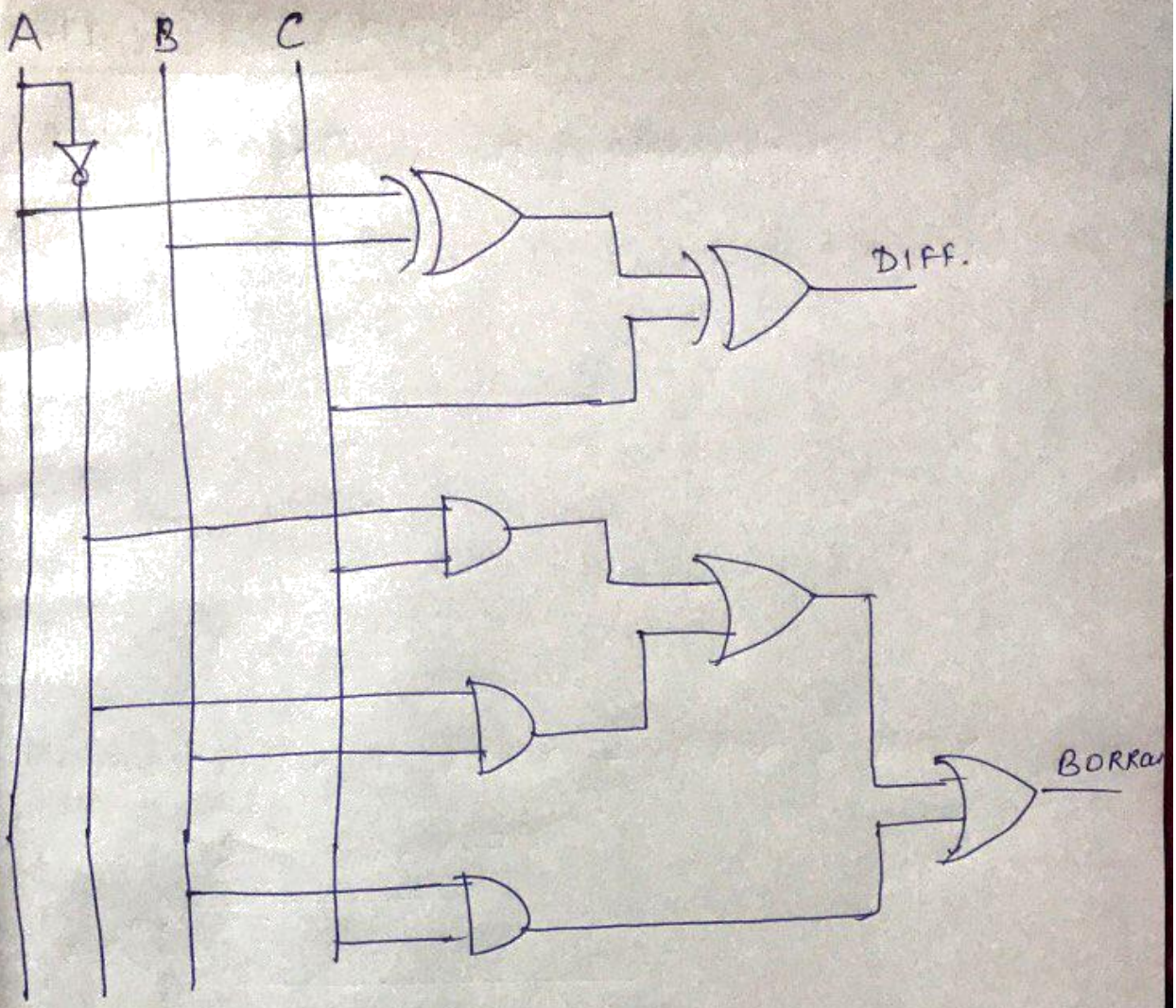
$= \bar{A}\{A \oplus C\} + A\{B \oplus C\}'$

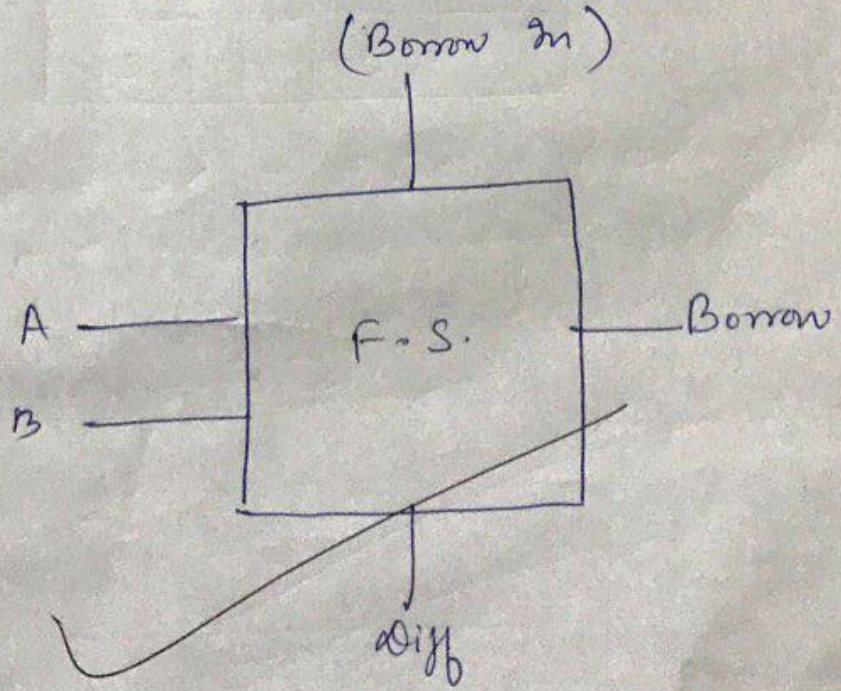
$= A \oplus B \oplus C$

Borrow: $\Sigma(1, 2, 3, 7)$

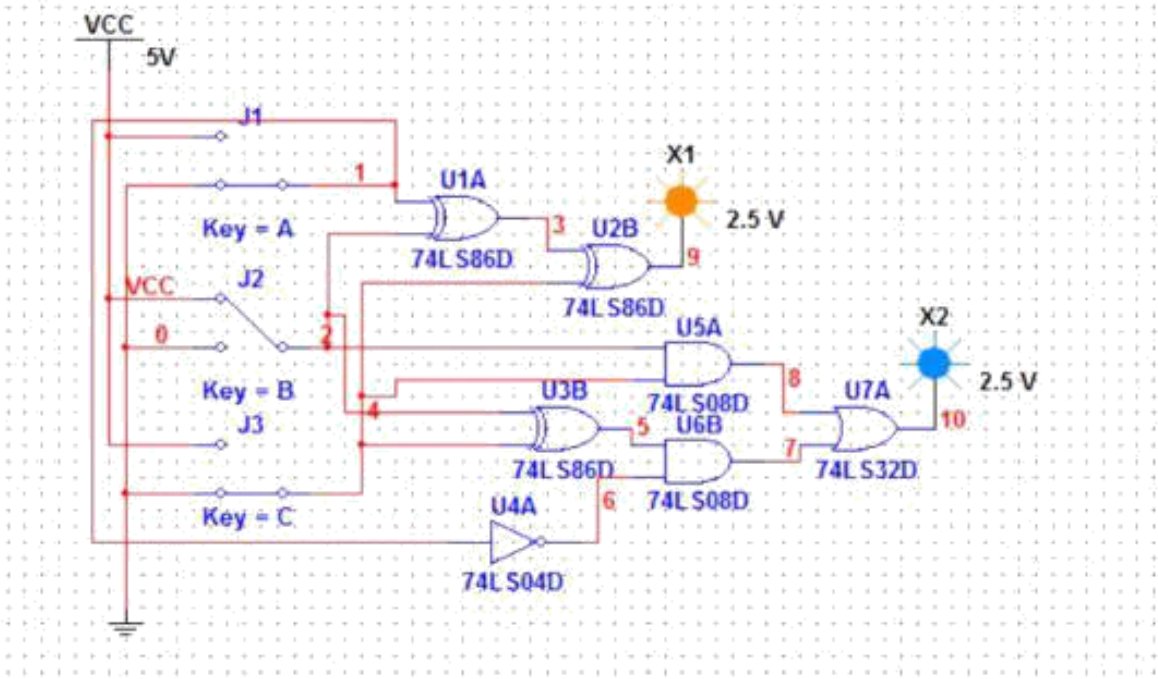


$= \bar{A}C + \bar{A}B + BC$





4) FULL SUBTRACTOR



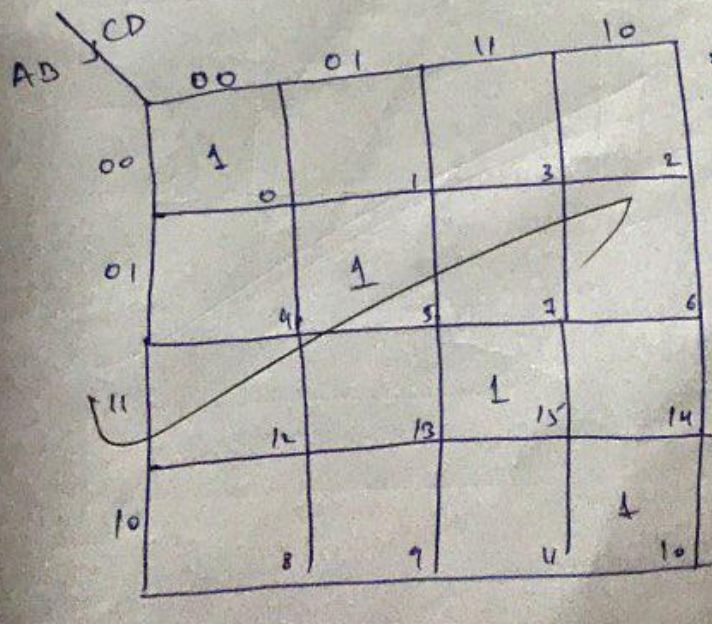
Exp- 4.

MAGNITUDE COMPARATOR

(2 bit Magnitude Comparator)

A		B				
A_0	A_1	B_0	B_1	A = B	A > B	A < B
0	0	0	0	1	0	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	0	1	0
0	1	0	1	1	0	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	0	1	0
1	0	0	1	0	1	0
1	0	1	0	1	0	0
1	0	1	1	0	1	0
1	1	0	0	0	1	0
1	1	0	1	0	1	0
1	1	1	0	0	1	0
1	1	1	1	1	0	0

For $A = B$; $\Sigma(0, 15, 10, 5)$



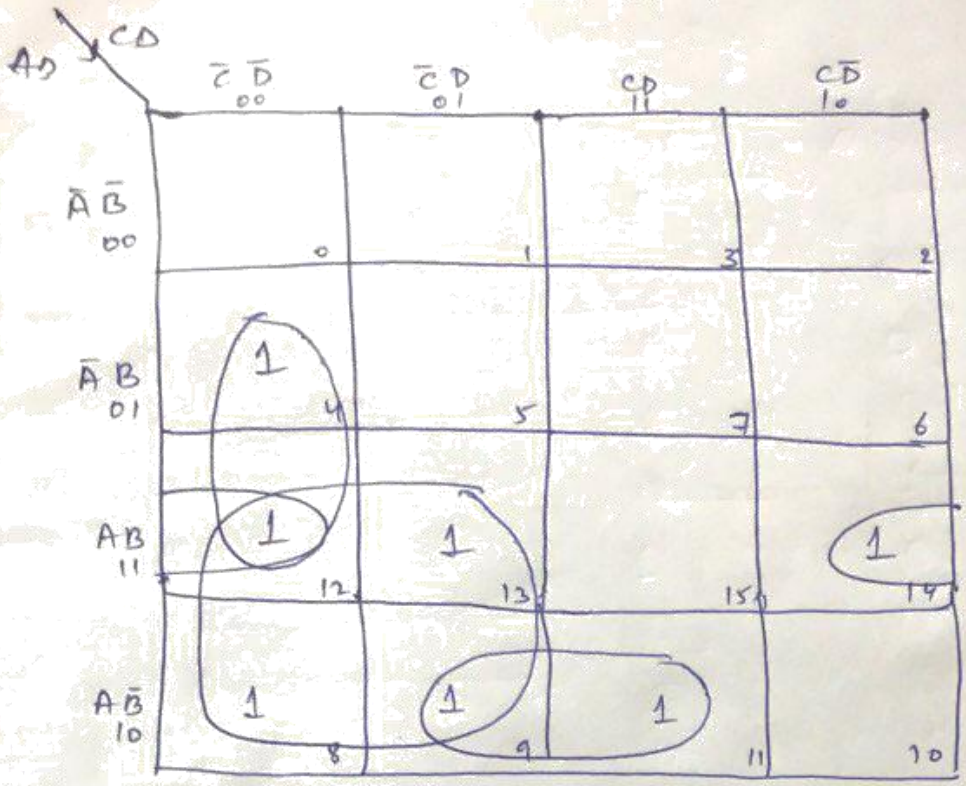
$= \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}D + ABCD + A\bar{B}C\bar{D}$

$= \bar{A}\bar{C}(\bar{B}\bar{D} + BD) + AC(BD + \bar{B}\bar{D})$

$= (\bar{B}\bar{D} + BD) + (\bar{A}\bar{C} + AC)$

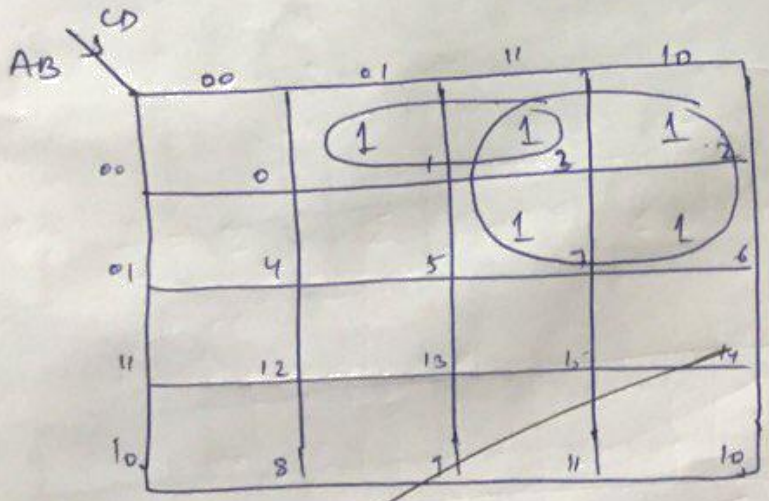
$= (B \oplus D)' + (A \oplus C)$

For $A > B$: $\Sigma(4, 8, 9, 11, 12, 13, 14)$

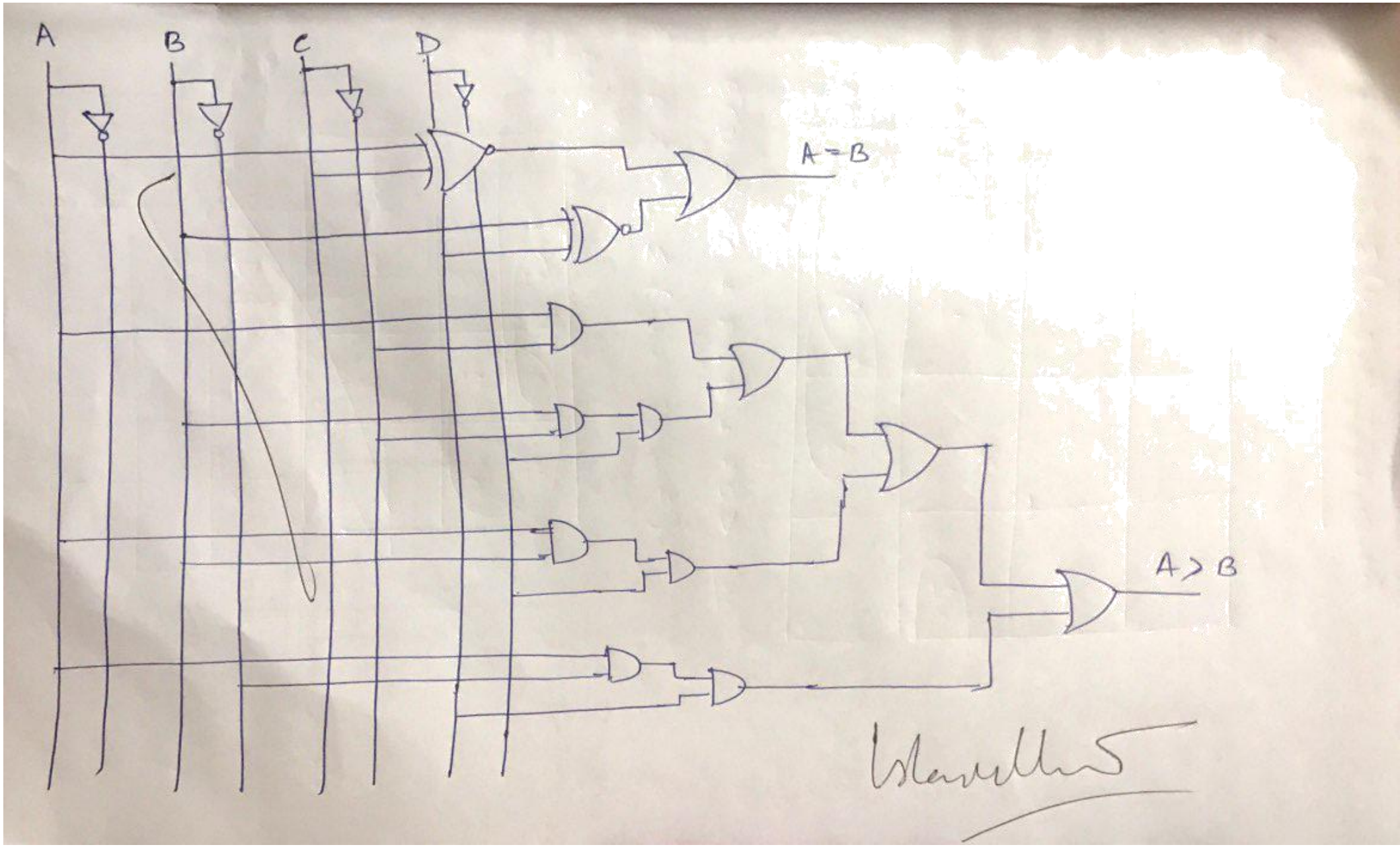


$B\bar{C}\bar{D} + A\bar{C} + AB\bar{D} + A\bar{B}D$ ans.

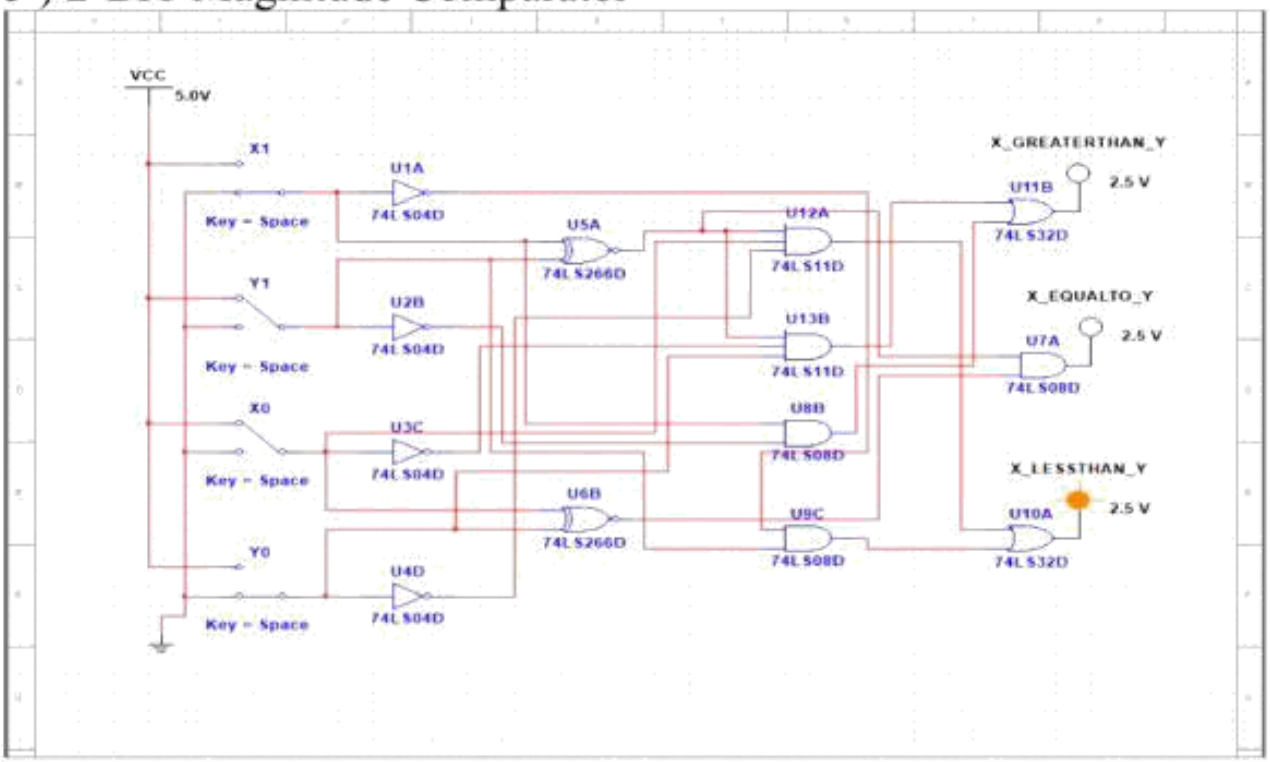
for $A < B$: $\Sigma(1, 2, 3, 6, 7)$



~~$\bar{A}\bar{B}D$~~ $\bar{A}\bar{B}D + AC$ ans.



5) 2-BIT Magnitude Comparator



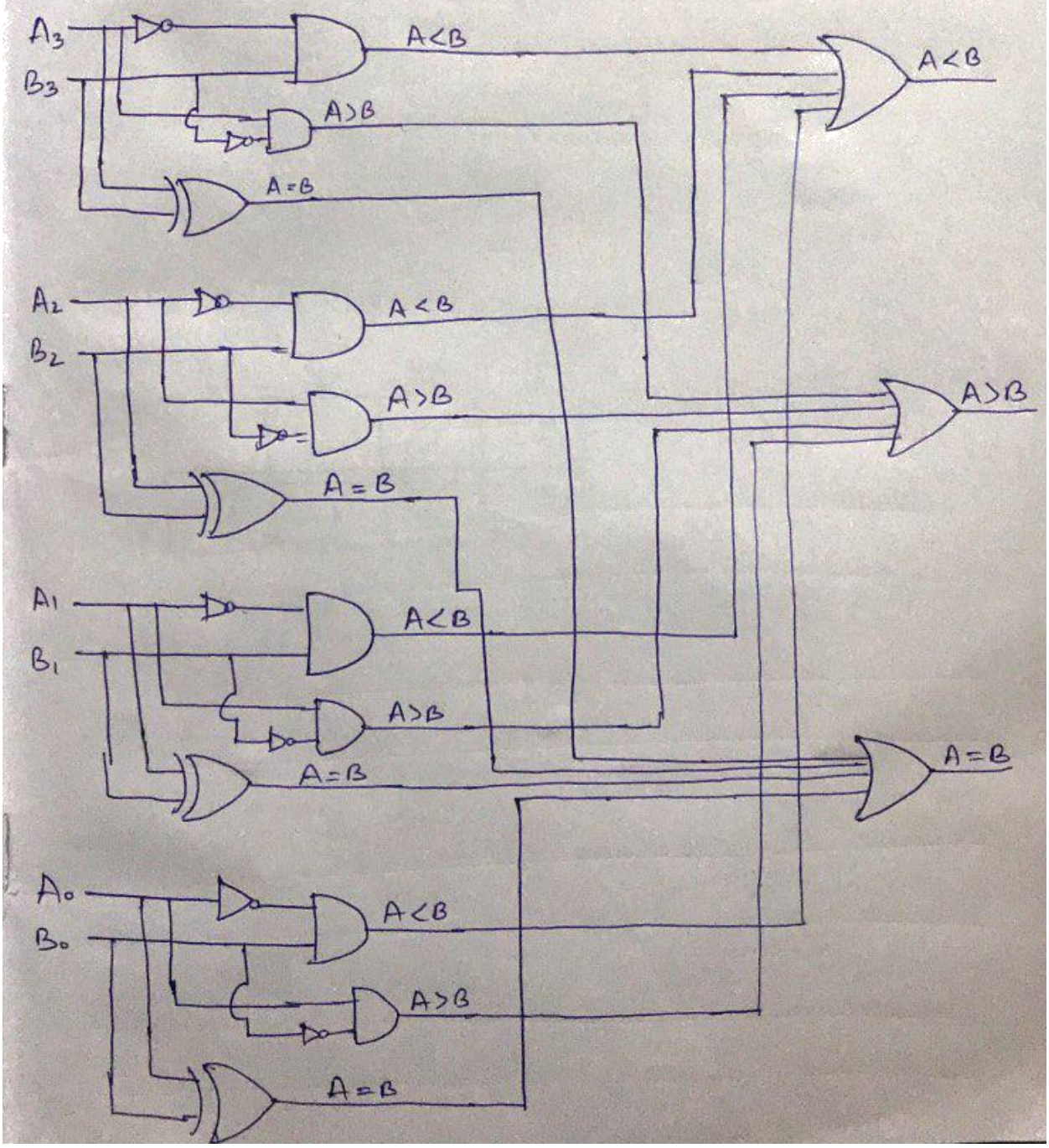
(4-bit Magnitude Comparator)

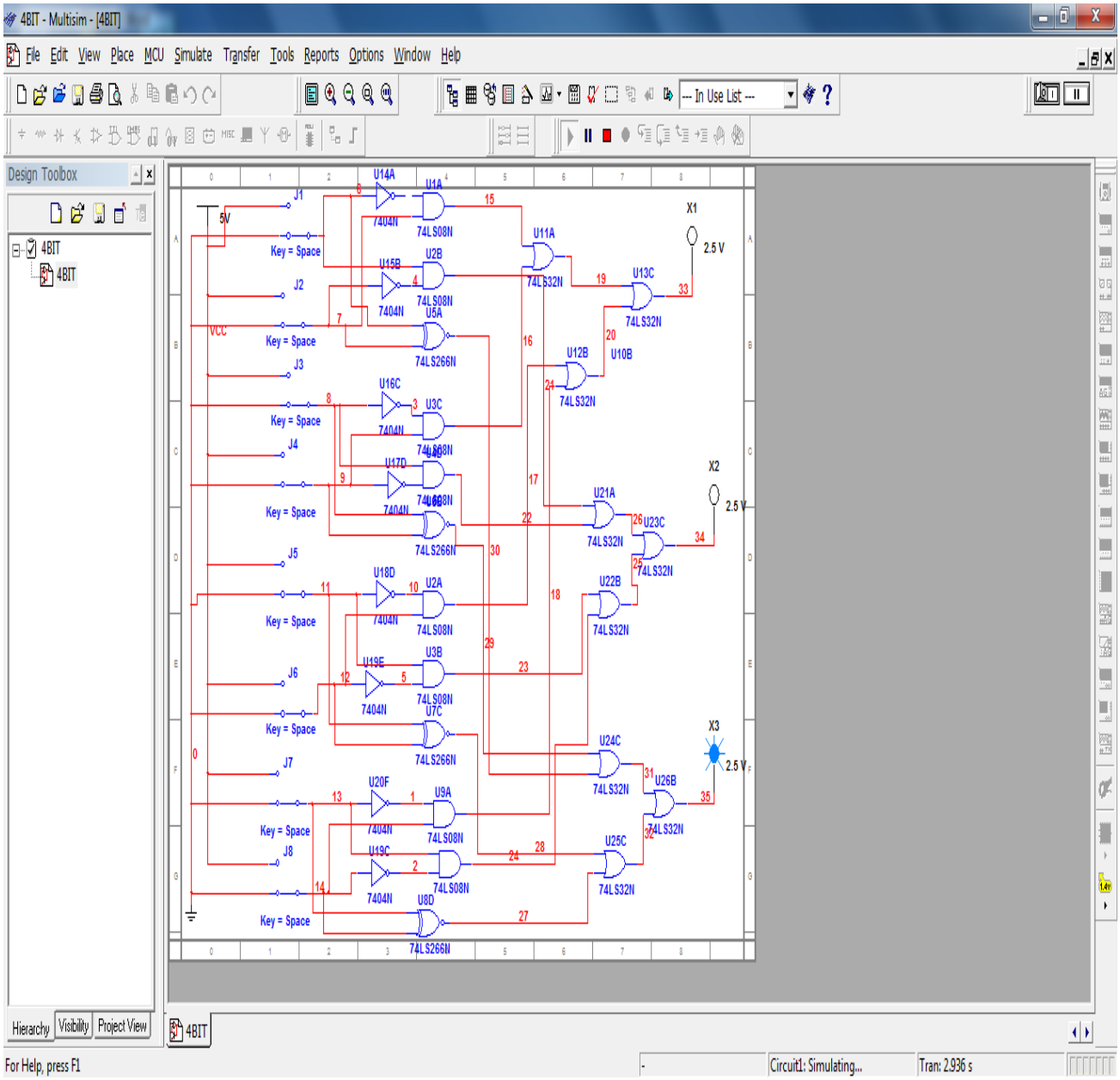
Using 4, 1-bit magnitude comparators

for 1 bit magnitude comparator

A	B	A<B	A>B	A=B
0	0	0	0	1
0	1	1	0	0
1	0	0	1	0
1	1	0	1	1

$F(A<B) = \bar{A}B$, $F(A>B) = A\bar{B}$, $F(A=B) = A \oplus B$

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File Edit View Place MCU Simulate Transfer Tools Reports Options Window Help
-- In Use List --
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4BIT
Hierarchy
Visibility
Project View
5V
VCC
J1
J2
J3
J4
J5
J6
J7
J8
Key = Space
U14A
U15B
U16C
U17D
U18D
U19E
U20F
U19C
7404N
U1A
U2B
U5A
U3C
U6B
U7C
U9A
U8D
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U12B
U10B
U21A
U23C
U22B
U24C
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U25C
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For Help, press F1
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