AND GATE:

Boolean Expression: **AND**(A,B) = A.B

Symbol:

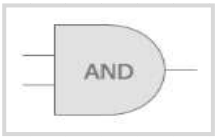
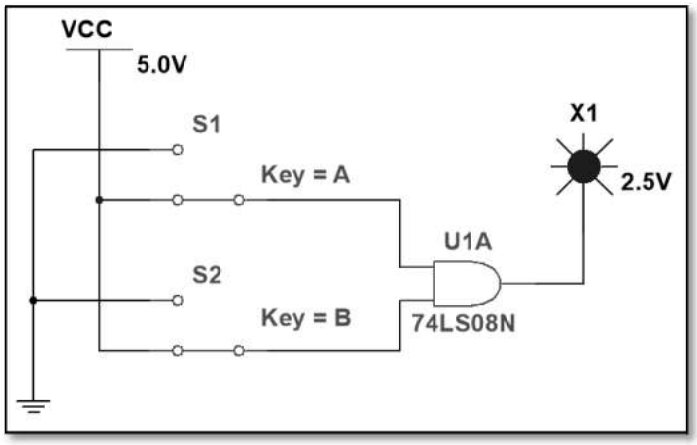


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

OR GATE:

Boolean Expression: **OR**(A,B) = A+B

Symbol:

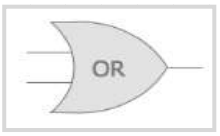
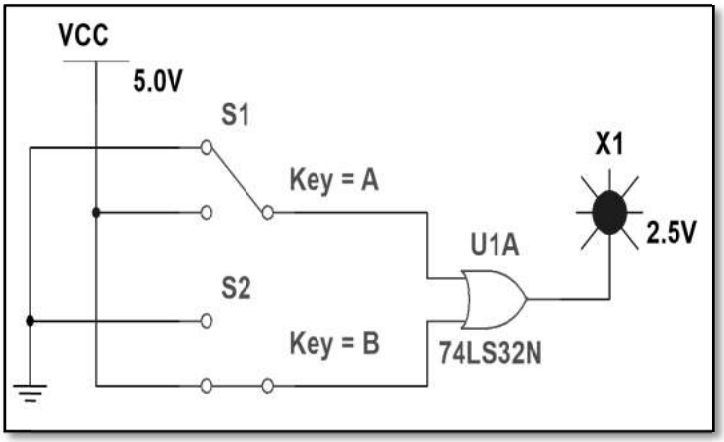


Diagram:



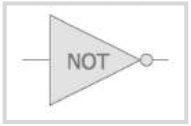
Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

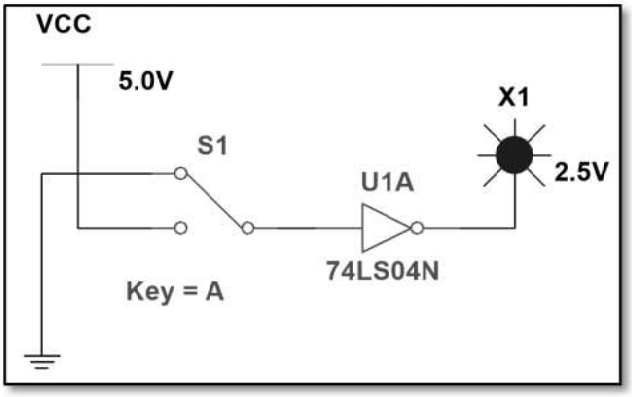
NOT GATE:

Boolean Expression: **NOT**(A) = A'

Diagram:

Symbol:





Truth Table	
A	Q
0	1
1	0

NAND GATE:

Boolean Expression: N **AND**(A,B) = (A.B)'

Symbol:

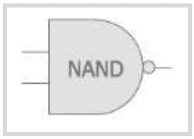
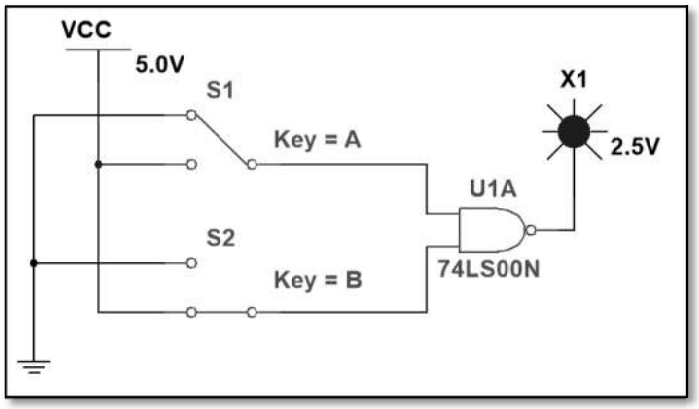


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

NOR GATE:

Boolean Expression: N**OR**(A,B) = (A+B)'

Symbol:

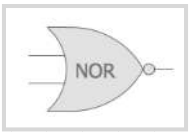
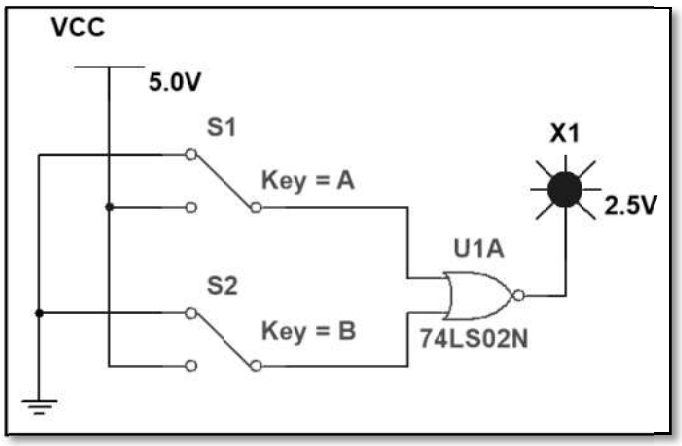


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	0

XOR GATE:

Boolean Expression: **XOR**(A,B) = A $\oplus$ B=(AB'+A'B)

Symbol:

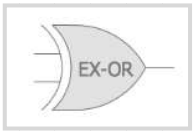
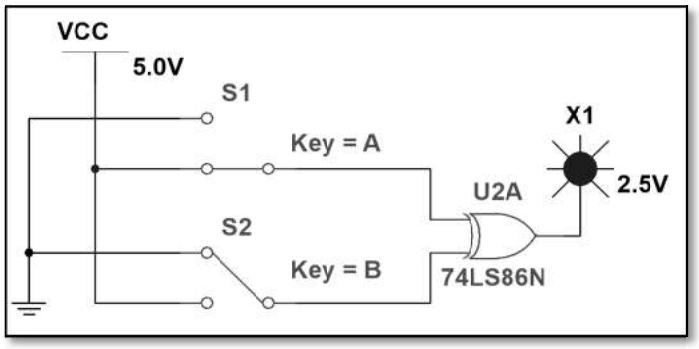


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

XNOR GATE:

Boolean Expression: **XNOR**(A,B) = A $\odot$ B=(AB)'+(AB)

Symbol:

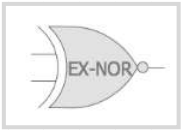
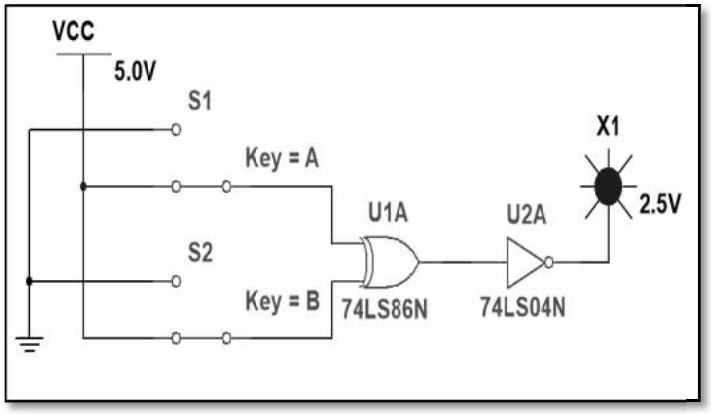


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

AND WITH NAND GATE:

Boolean Expression: **AND**(A,B) = A.B

Symbol:

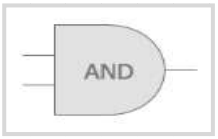
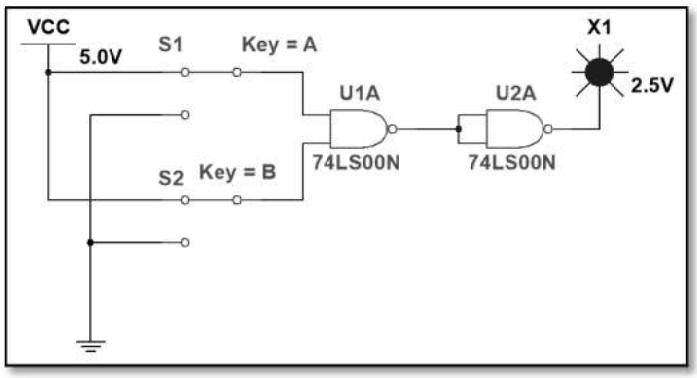


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

OR WITH NAND GATE:

Boolean Expression: **OR**(A,B) = A+B

Symbol:

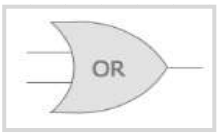
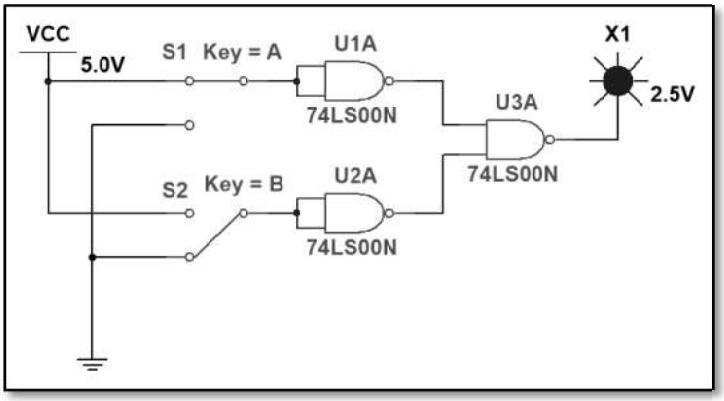


Diagram:



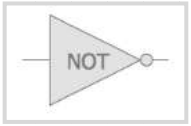
Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

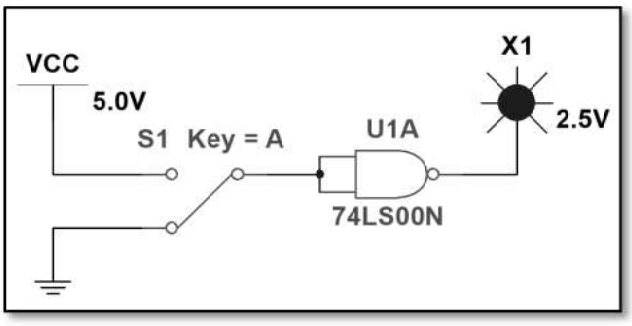
NOT WITH NAND GATE:

Boolean Expression: **NOT**(A) = A'

Diagram:

Symbol:





Truth Table	
A	Q
0	1
1	0

XOR WITH NAND GATE:

Boolean Expression: **XOR**(A,B) = A $\oplus$ B=(AB'+A'B)

Symbol:

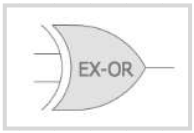
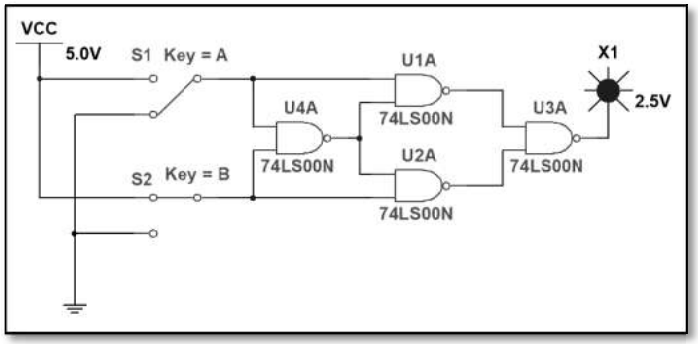


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

XNOR WITH NAND GATE:

Boolean Expression: **XNOR**(A,B) = A $\odot$ B=(AB)'+(AB)

Symbol:

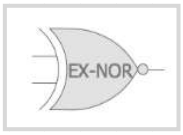
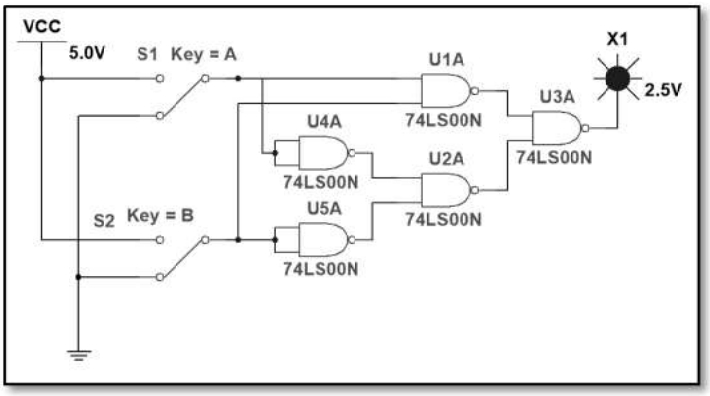


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

NOR WITH NAND GATE:

Boolean Expression: **NOR**(A,B) = (A+B)'

Symbol:

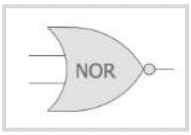
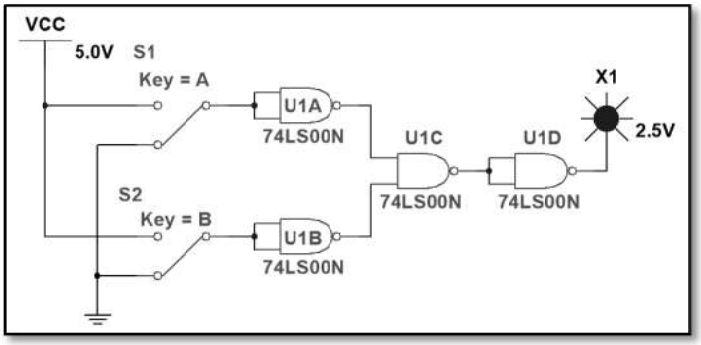


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	0

AND WITH NOR GATE:

Boolean Expression: **AND**(A,B) = A.B

Symbol:

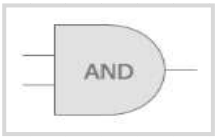
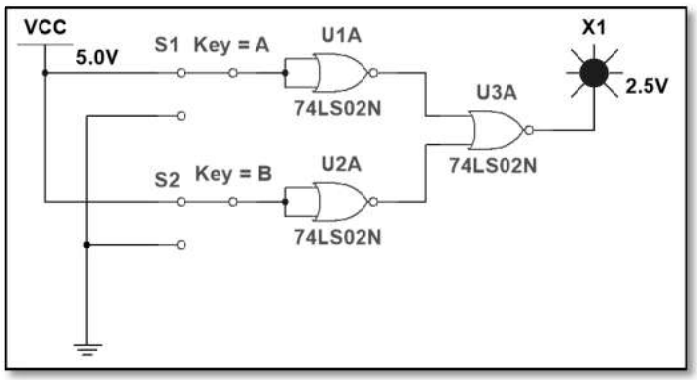


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

OR WITH NOR GATE:

Boolean Expression: **OR**(A,B) = A+B

Symbol:

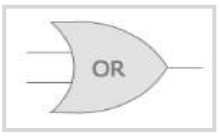
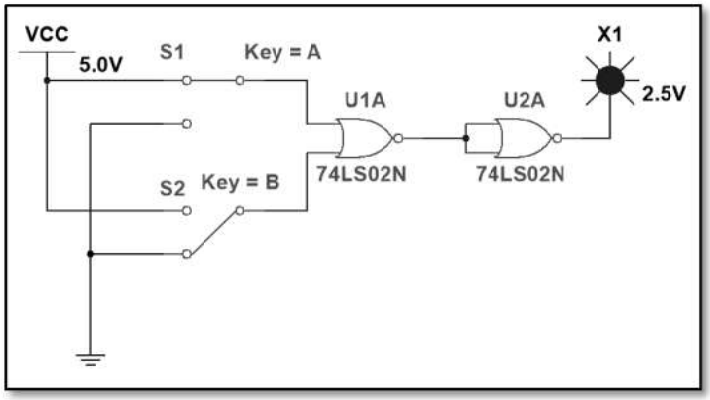


Diagram:



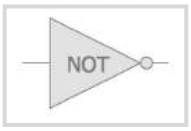
Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

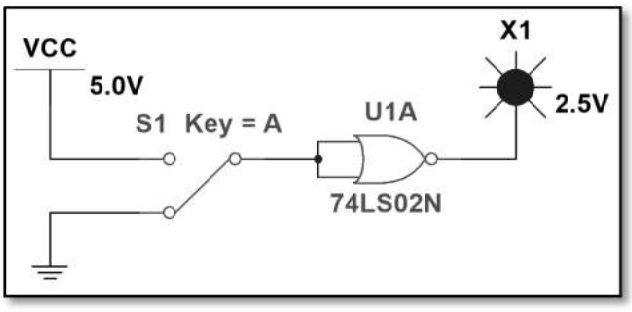
NOT WITH NOR GATE:

Boolean Expression: **NOT**(A) = A'

Diagram:

Symbol:





Truth Table	
A	Q
0	1
1	0

XOR WITH NOR GATE:

Boolean Expression: **XOR**(A,B) = A $\oplus$ B=(AB'+A'B)

Symbol:

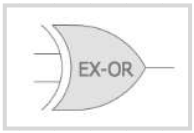
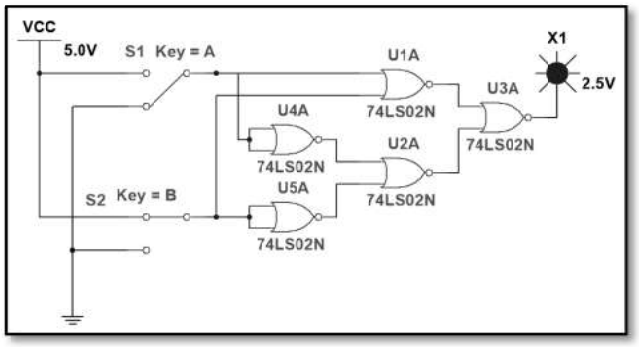


Diagram:



Truth Table		
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

XNOR WITH NOR GATE:

Boolean Expression: **XNOR**(A,B) = A $\odot$ B=(AB)'+(AB)

Symbol:

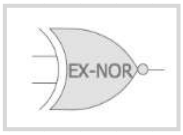
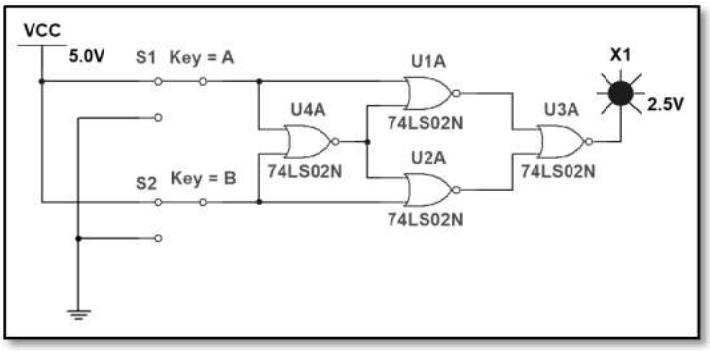


Diagram:



Truth Table		
A	B	Q
0	0	1
0	1	0
1	0	0
1	1	1

NAND WITH NOR GATE:

Boolean Expression: **NOR**(A,B) = (A+B)'

Symbol:

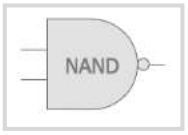
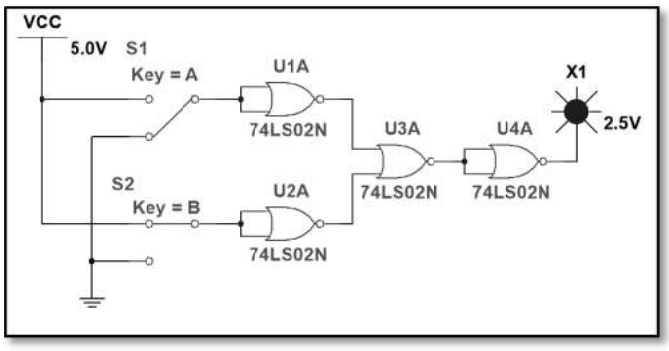


Diagram:

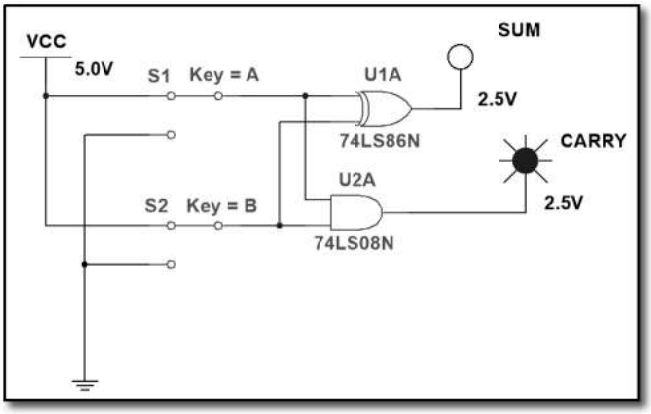


Truth Table		
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

HALF ADDER:

Boolean Expression: **SUM BIT** = **XOR**(A,B) = A ⊕ B **CARRY BIT** = **AND**(A,B) = A.B

Diagram:

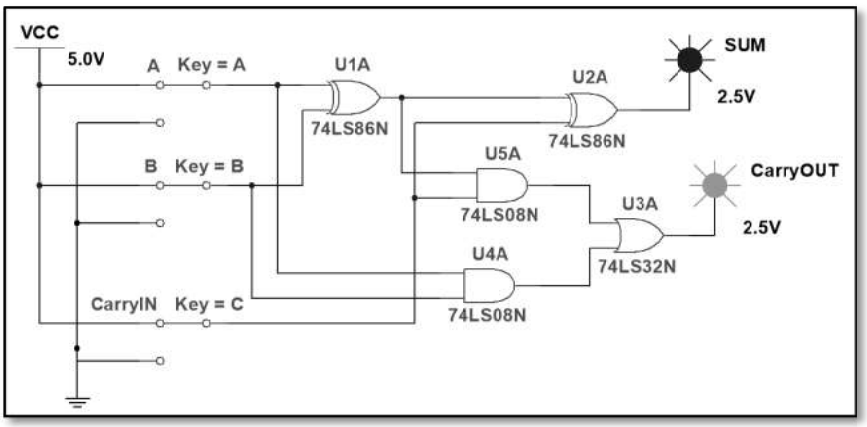


Truth Table			
B	A	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

FULL ADDER:

Boolean Expression: **SUM BIT** = **XOR**(A,B,C)= A⊕B⊕C

Diagram:

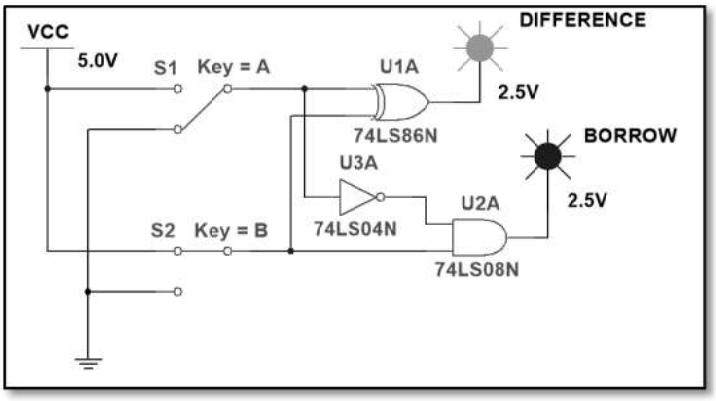


Truth Table				
C-in	B	A	Sum	C-out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

HALF SUBTRACTOR:

Boolean Expression: DIFFERENCE BIT = XOR(A,B) = A ⊕ B
BORROW BIT = AND(**NOT**(A),B) = A'.B

Diagram:

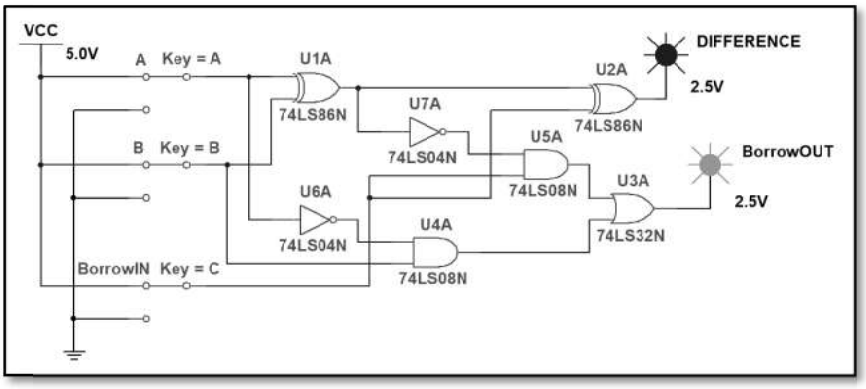


Truth Table			
Y	X	DIFFERENCE	BORROW
0	0	0	0
0	1	1	0
1	0	1	1
1	1	0	0

FULL SUBTRACTOR:

Boolean Expression: DIFFERENCE BIT = XOR(A,B,C)= A⊕B⊕C

Diagram:



Truth Table				
B-in	Y	X	Diff.	B-out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	0
1	1	0	0	1
1	1	1	1	1