# **AND GATE:**

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

Diagram:



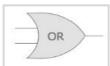
С			
5.0V			
S1			X1
	Key = A		2.5V
S2		U1A	
	Key = B	74LS08N	
	5.0V S1	5.0V S1 Key = A	5.0V S1 Key = A U1A S2

Truth Table		
Α	В	Q
0	0	0
0	1	0
1	0	0
1	1	1

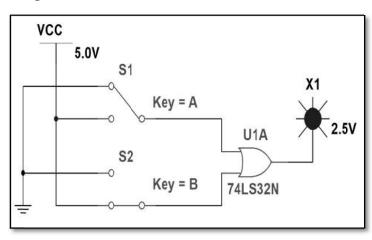
## **OR GATE:**

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

Symbol:



#### Diagram:

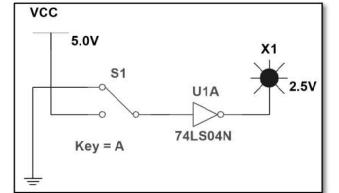


Truth Table		
А	В	Q
0	0	0
0	1	1
1	0	1
1	1	1

# **NOT GATE:**

Boolean Expression: NOT(A) = A'

Diagram:



Symbol:

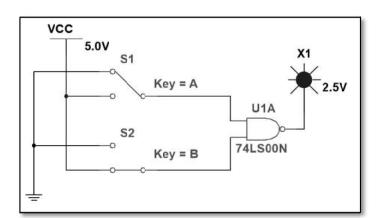


Truth Table		
А	Q	
0	1	
1	0	

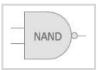
# **NAND GATE:**

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

Diagram:





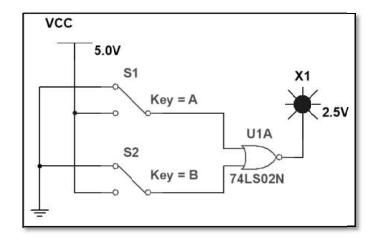


Truth Table		
А	В	Q
0	0	1
0	1	1
1	0	1
1	1	0

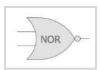
## **NOR GATE:**

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





Symbol	١.
SVMNA	•
3411100	



Truth Table		
А	В	Q
0	0	1
0	1	0
1	0	0
1	1	0

# **XOR GATE:**

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

Diagram:



VCC				
	5.0V	51		
			X1	
		Key = A		
			U2A 2	.5V
		52		
	4	Key = B	74LS86N	
느 나		<b>\rightarrow</b>		

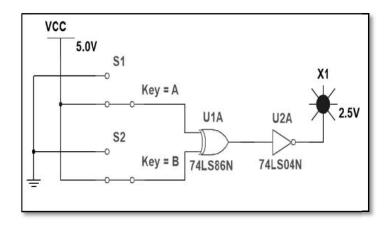
Truth Table			
А	В	Q	
0	0	0	
0	1	1	
1	0	1	
1	1	0	

## **XNOR GATE:**

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







Truth Table			
Α	В	Q	
0	0	1	
0	1	0	
1	0	0	
1	1	1	

## **AND WITH NAND GATE:**

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

Diagram:



VCC 5.0V	S1 Key = A	X1
	U1A	U2A 2.5V
	S2 Key = B 74LS00N	74LS00N
-	o	

Truth Table		
А	В	Q
0	0	0
0	1	0
1	0	0
1	1	1

## **OR WITH NAND GATE:**

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

Diagram:





5.0V	/4LS00N	3A 2.5
	S2 Key = B U2A 74LS	600N
1		

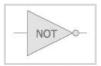
Truth Table			
А	В	Q	
0	0	0	
0	1	1	
1	0	1	
1	1	1	

# **NOT WITH NAND GATE:**

Boolean Expression: NOT(A) = A'

Diagram:

Symbol:



5.0V S1 Key = A	74LS00N
<u></u>	

Truth Table		
А	Q	
0	1	
1	0	

### **XOR WITH NAND GATE:**

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

Diagram:





5.0V S1 Key = A	U1A	X1
	U4A 74LS00N	U3A 2.5
S2 Key = B 741	SOON U2A 7	4LS00N
	74LS00N	

Truth Table			
А	В	Q	
0	0	0	
0	1	1	
1	0	1	
1	1	0	

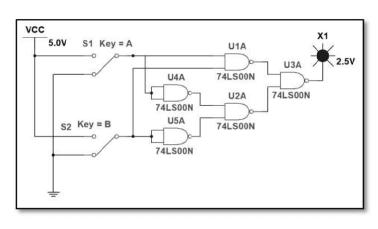
### **XNOR WITH NAND GATE:**

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

Symbol:



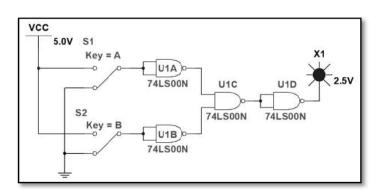
#### Diagram:



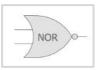
Truth Table		
А	В	Q
0	0	1
0	1	0
1	0	0
1	1	1

### **NOR WITH NAND GATE:**

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



Symbol:



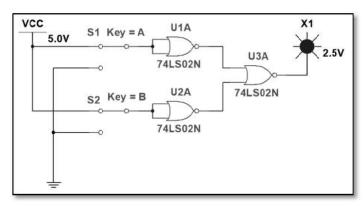
Truth Table			
А	В	Q	
0	0	1	
0	1	0	
1	0	0	
1	1	0	

## **AND WITH NOR GATE:**

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

Diagram:





Truth Table		
А	В	Q
0	0	0
0	1	0
1	0	0
1	1	1

# **OR WITH NOR GATE:**

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

Diagram:



5.0V	S1 Key = A			X1
		U1A	U2A	
	S2 Key = B 7	4LS02N	74LS02N	

Truth Table			
А	В	Q	
0	0	0	
0	1	1	
1	0	1	
1	1	1	

# **NOT WITH NOR GATE:**

Boolean Expression: NOT(A) = A'





vcc	X1
5.0V S1 Key = A	74LS02N
=	

Truth Table			
А	Q		
0	1		
1	0		

## **XOR WITH NOR GATE:**

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

Diagram:





	100		U3A
	U4A	74LS02N U2A	74LS02N
S2 Key = B	74LS02N U5A	74LS02N	
32 117		74L302N	
- 0	74LS02N		

Truth Table				
А	В	Q		
0	0	0		
0	1	1		
1	0	1		
1	1	0		

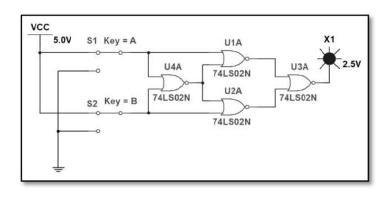
### **XNOR WITH NOR GATE:**

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

Symbol:



Diagram:



Truth Table			
А	В	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:



D:	~		~ "	•	
Di	аş	ζľ	ar	H.	•

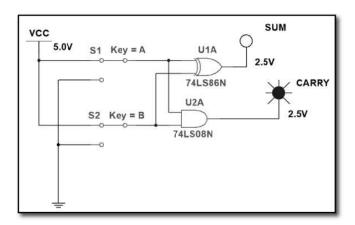
5.0	V S1 Key = A	U1A		X1	
_		74LS02N	U3A	U4A	2.5
	S2	U2A	74LS02N	74LS02N	
	Key = B	<b>→</b> □>>-	74L302N	74L302N	
+		74LS02N			

Truth Table			
Α	В	Q	
0	0	1	
0	1	1	
1	0	1	
1	1	0	

# **HALF ADDER:**

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

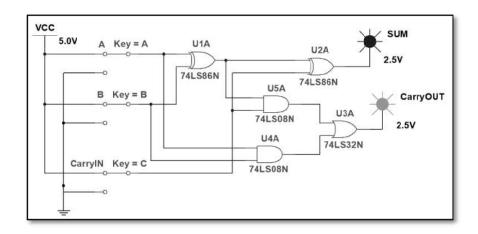
Diagram:



Truth Table				
В	А	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)=  $A \bigoplus B \bigoplus C$ 



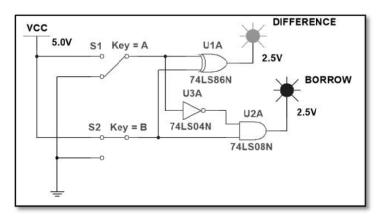
Truth Table				
C-in	В	А	Sum	C-out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

# **HALF SUBTRACTOR:**

**Boolean Expression:** DIFFERENCE BIT =  $XOR(A,B) = A \oplus B$ 

**BORROW BIT** = AND(NOT(A),B) = A'.B

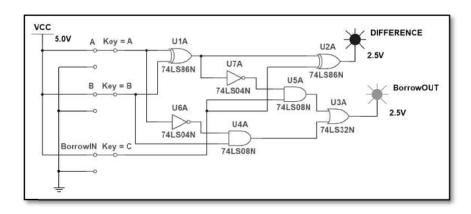
Diagram:



Truth Table				
Υ	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)=  $A \bigoplus B \bigoplus C$ 



Truth Table					
B-in	Υ	Χ	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	