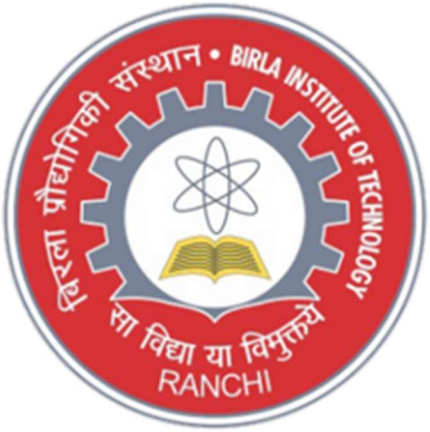
Birla Institute of Technology Mesra
Off Campus Deoghar



EC204
Digital System Design Lab
Experiment 1

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Roll no.: BTECH/60023/20
Semester: III

Date of experiment: 02 Aug 2021

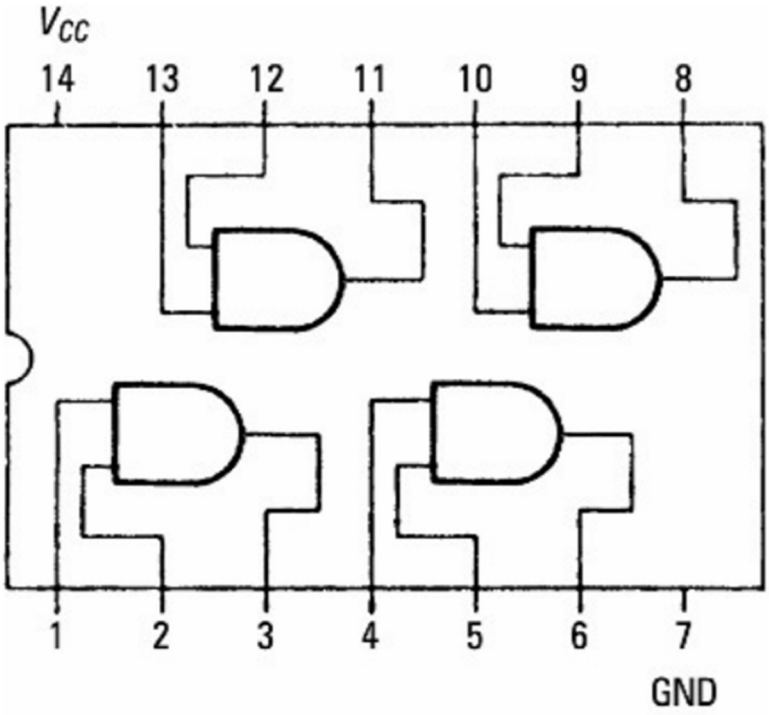
Aim: Verification and interpretation of truth table for AND, OR, NOT, NAND NOR, Ex-OR and Ex-Nor gates.

Apparatus: Logic trainer kit, logic gates / ICs and wires.

Theory: Logic gates are electronic circuits which perform logical functions on one or more inputs to produce one output. There are seven logic gates. When all the input combinations of a logic gate are written in a series and their corresponding outputs written along them, then this input/ output combination is called Truth Table.

AND Gate

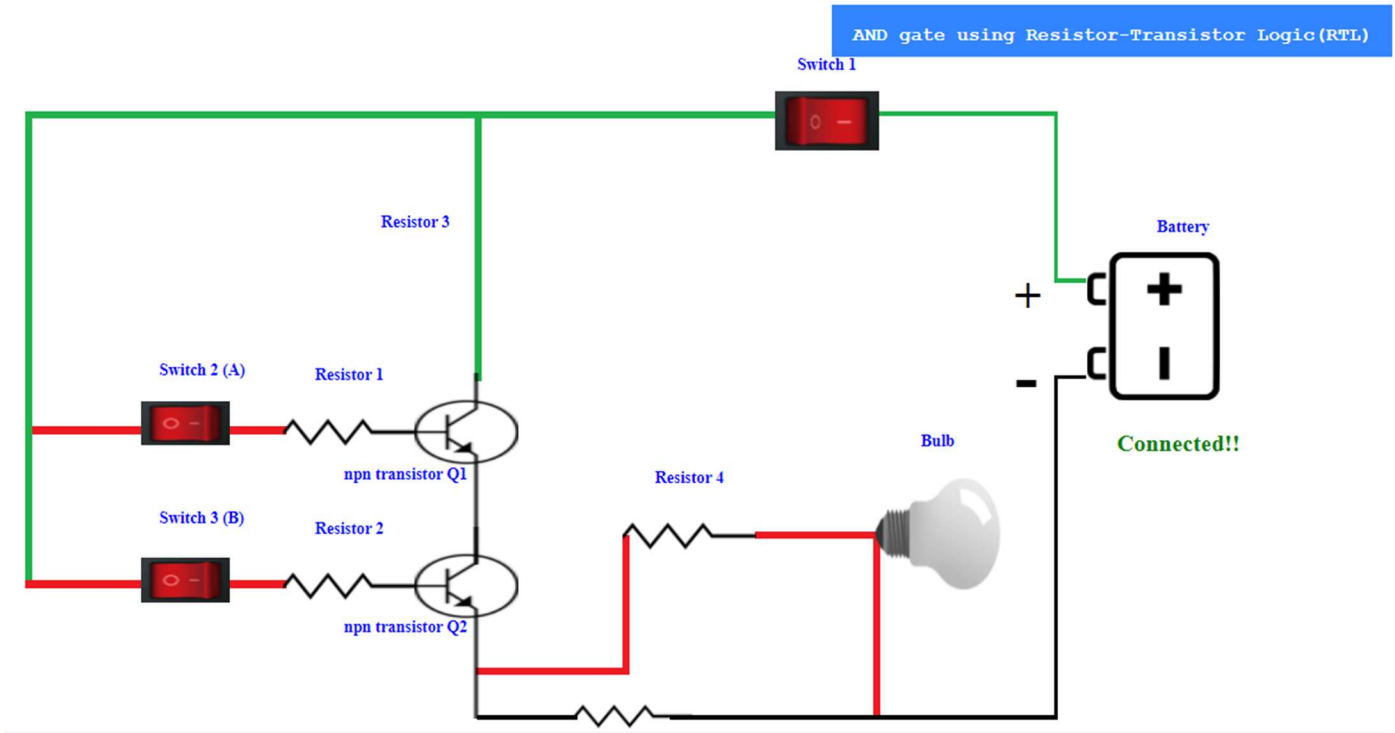
AND gate produces an output as 1, when all its inputs are 1; otherwise, the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when any input is 0.



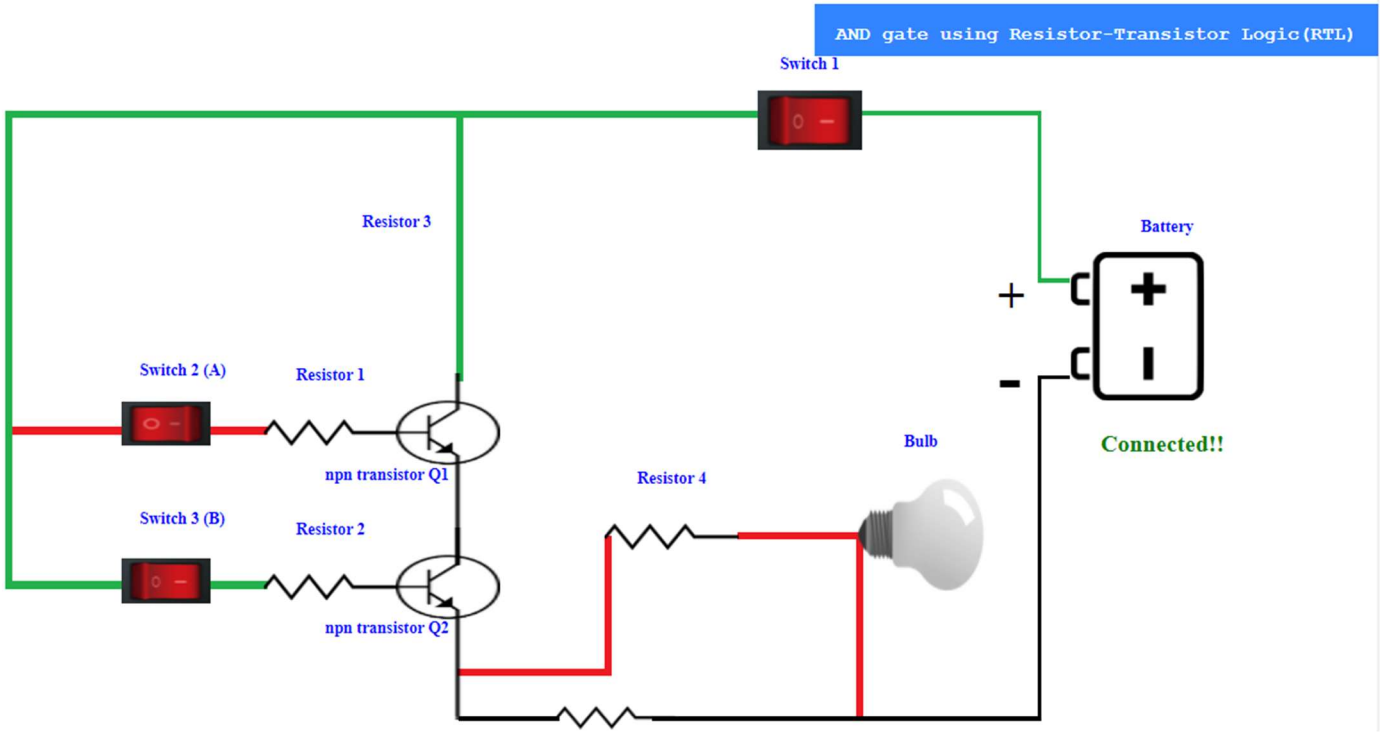
IC 7408

A	B	Y = A.B
0	0	0
0	1	0
1	0	0
1	1	1

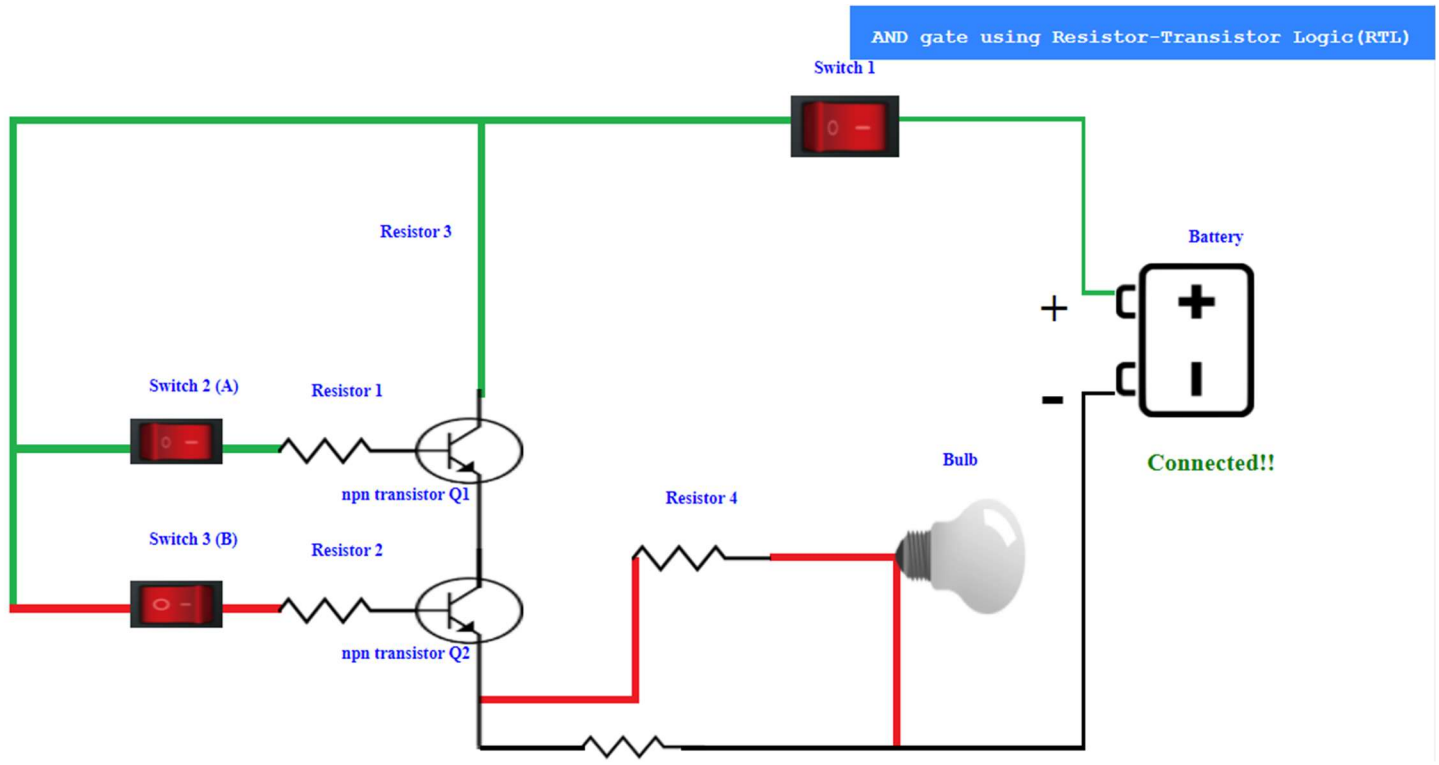
Truth table



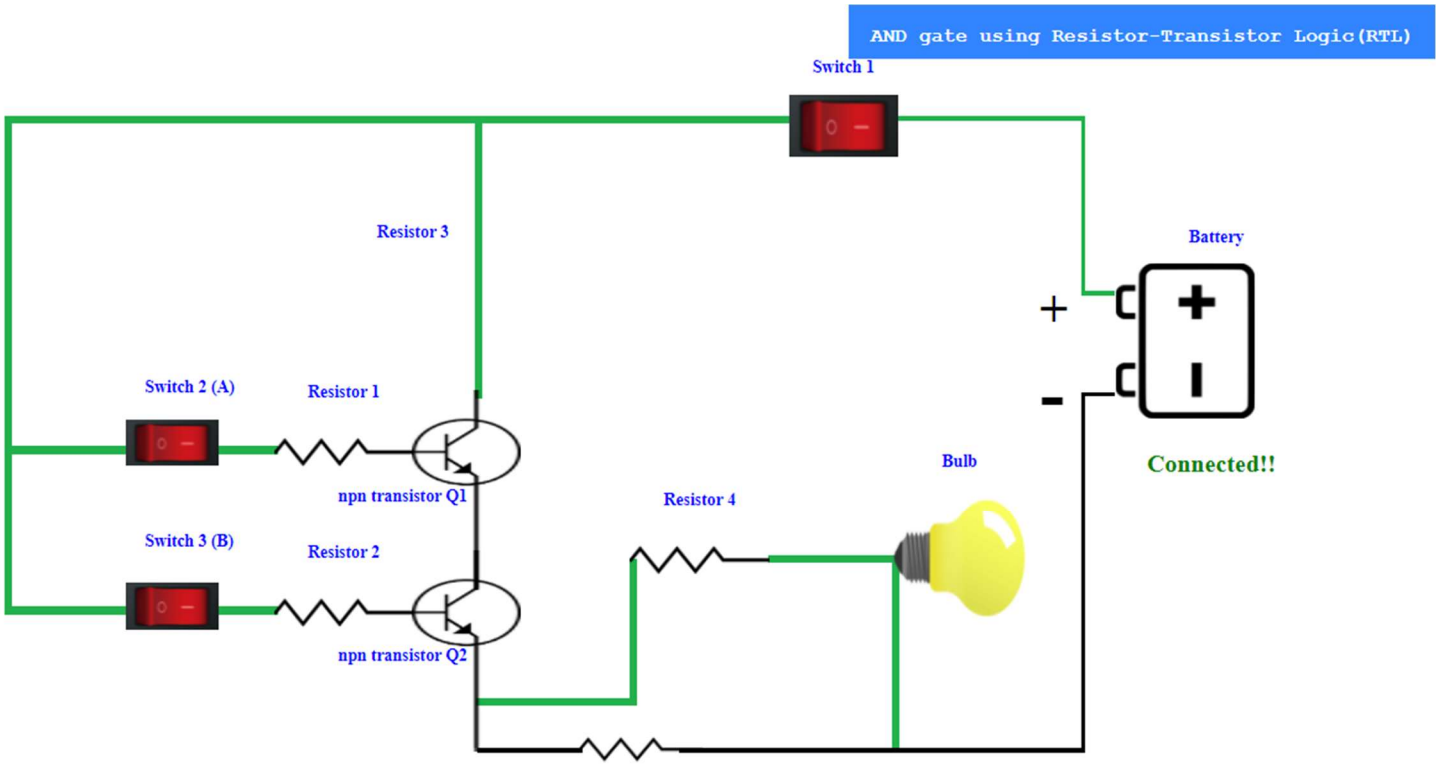
Both A and B are 0



A = 0 and B = 1



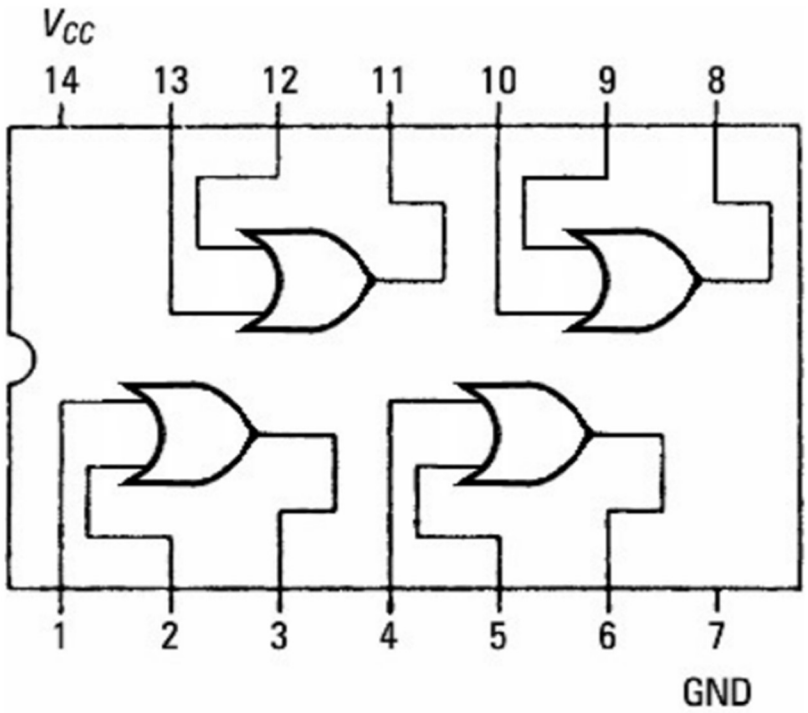
A = 1 and B = 0



Both A and B are 1

OR Gate

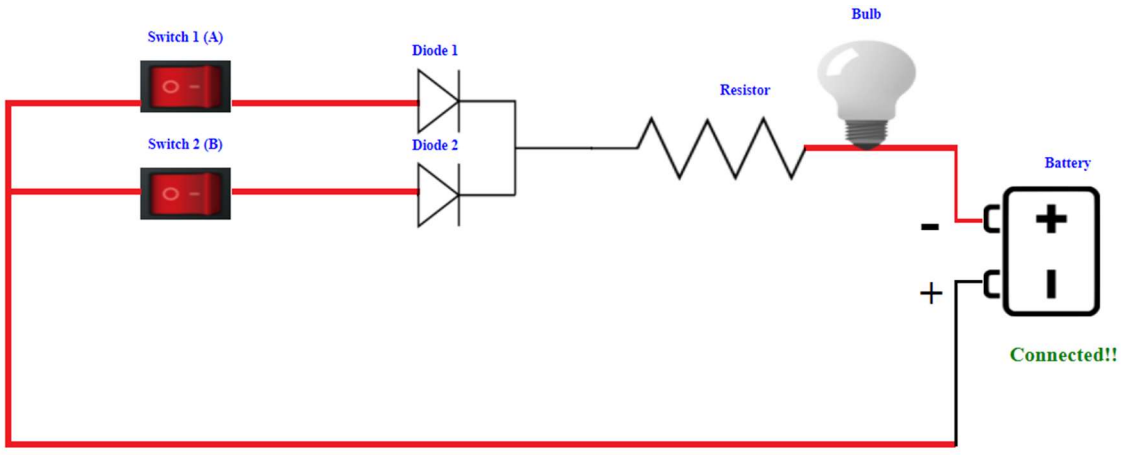
OR gate produces an output as 1, when any or all its inputs are 1; otherwise the output is 0. This gate can have minimum 2 inputs but output is always one. Its output is 0 when all input are 0.



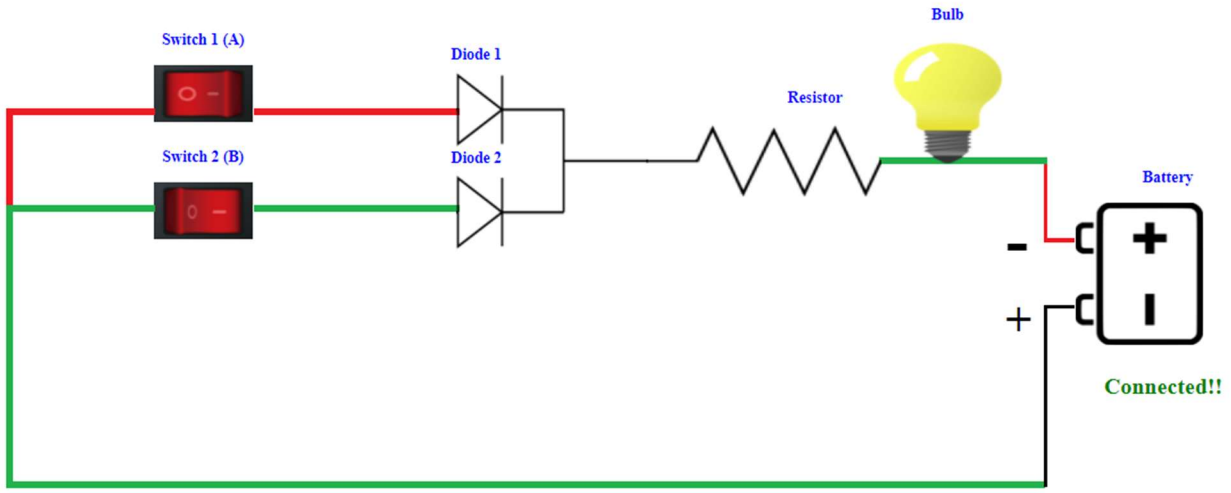
IC 7432

A	B	Y = A+B
0	0	0
0	1	1
1	0	1
1	1	1

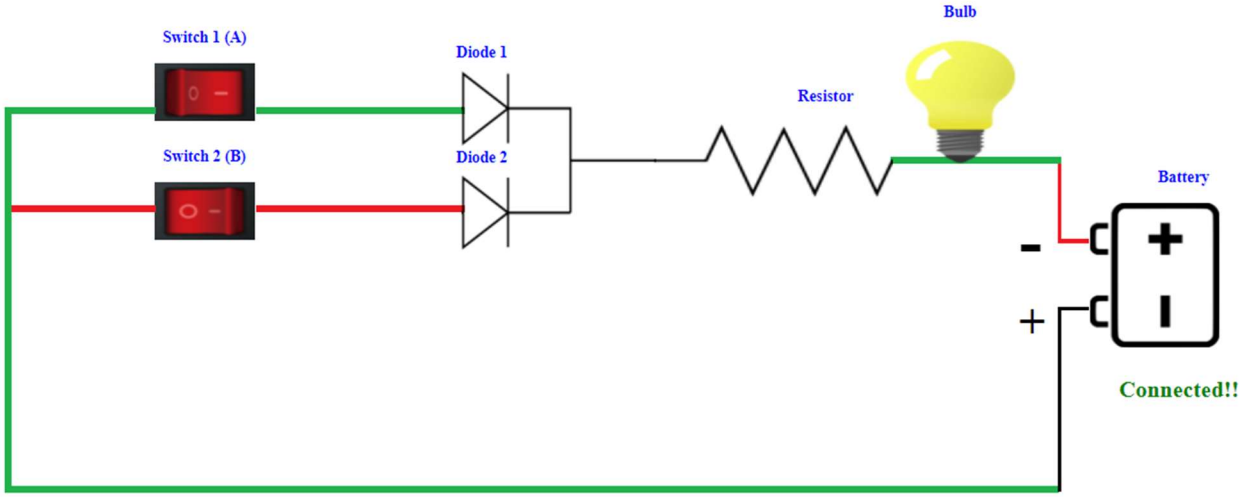
Truth table



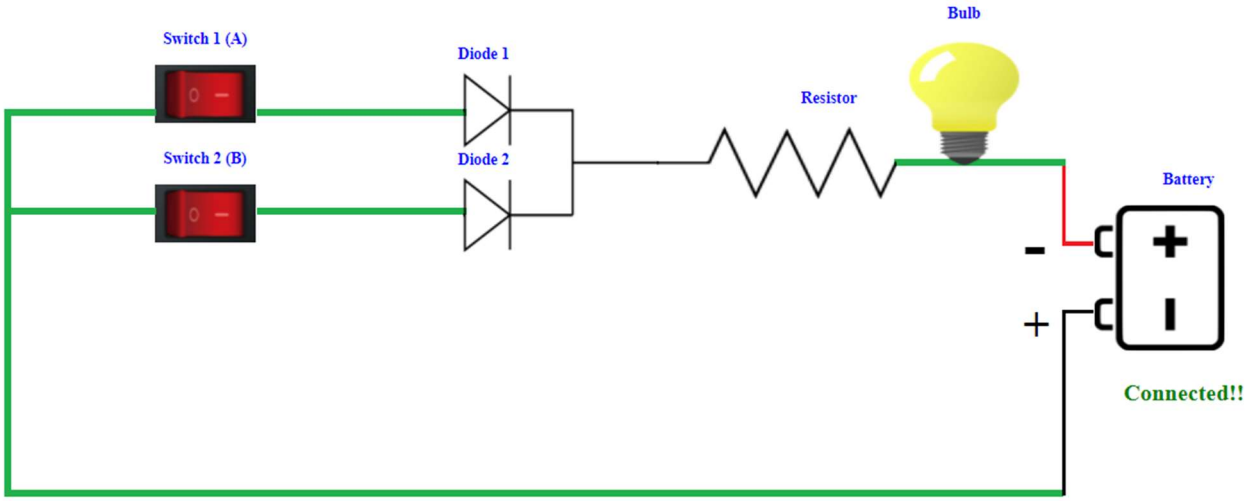
Both A and B are 0



A = 0 and B = 1



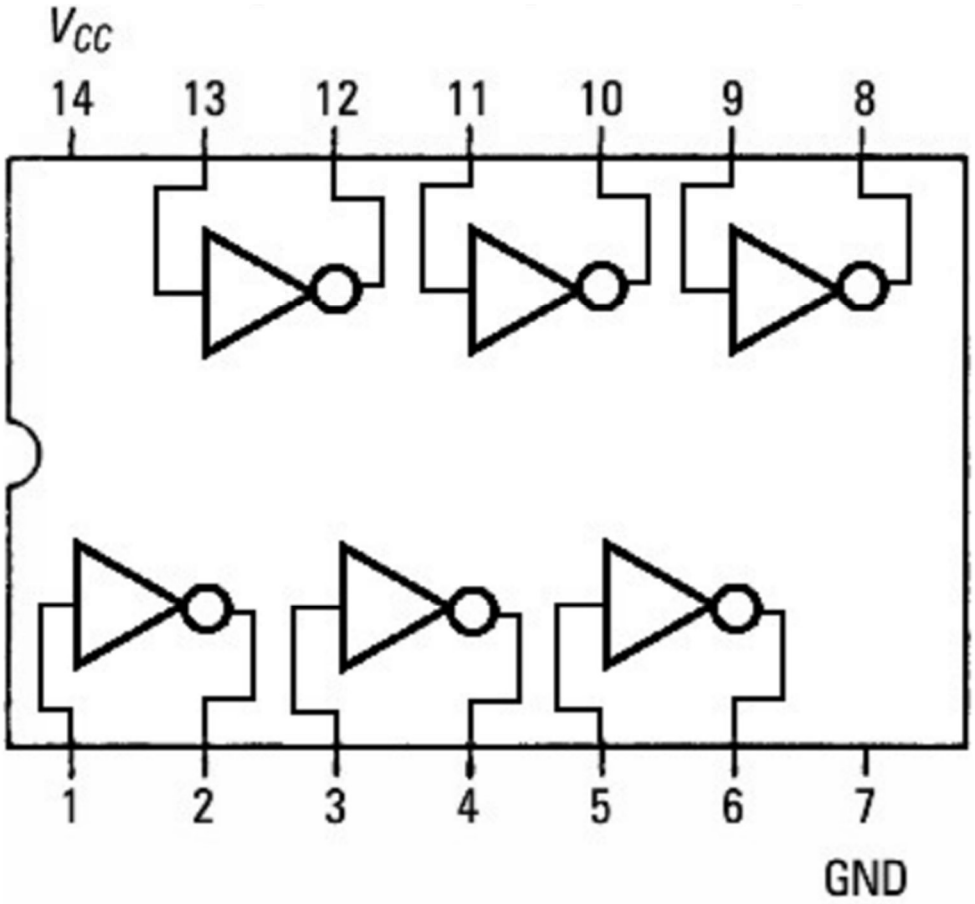
A = 1 and B = 0



Both A and B are 1

NOT Gate

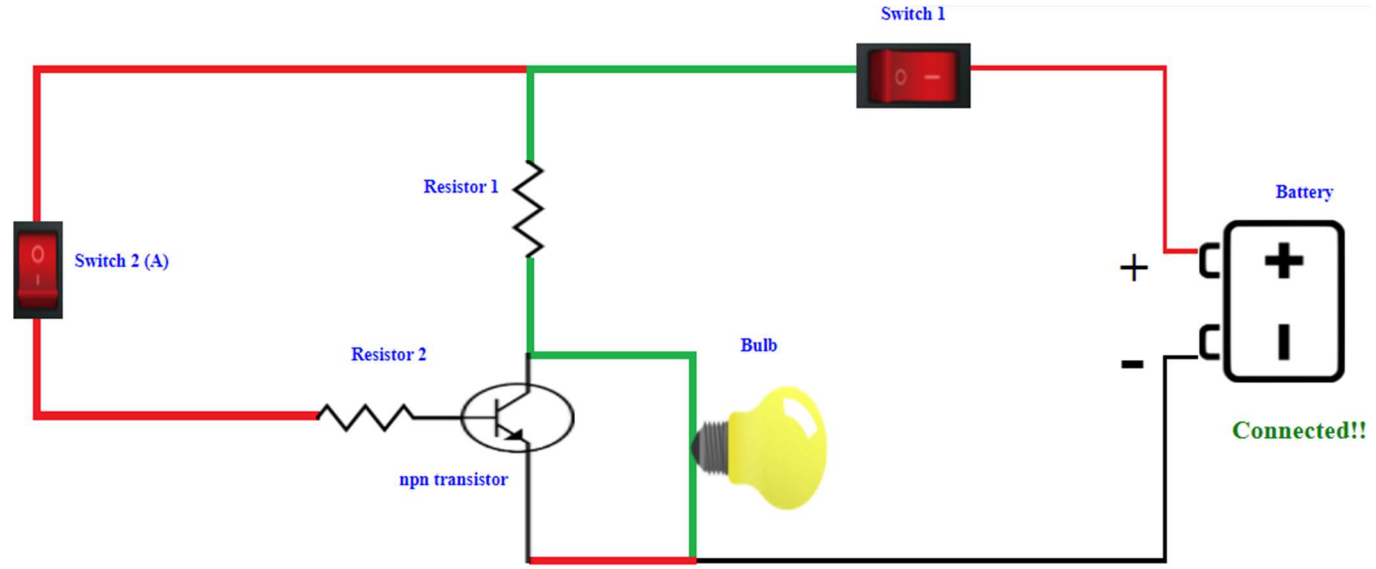
NOT gate produces the complement of its input. This gate is also called an INVERTER. It always has one input and one output. Its output is 0 when input is 1 and output is 1 when input is 0.



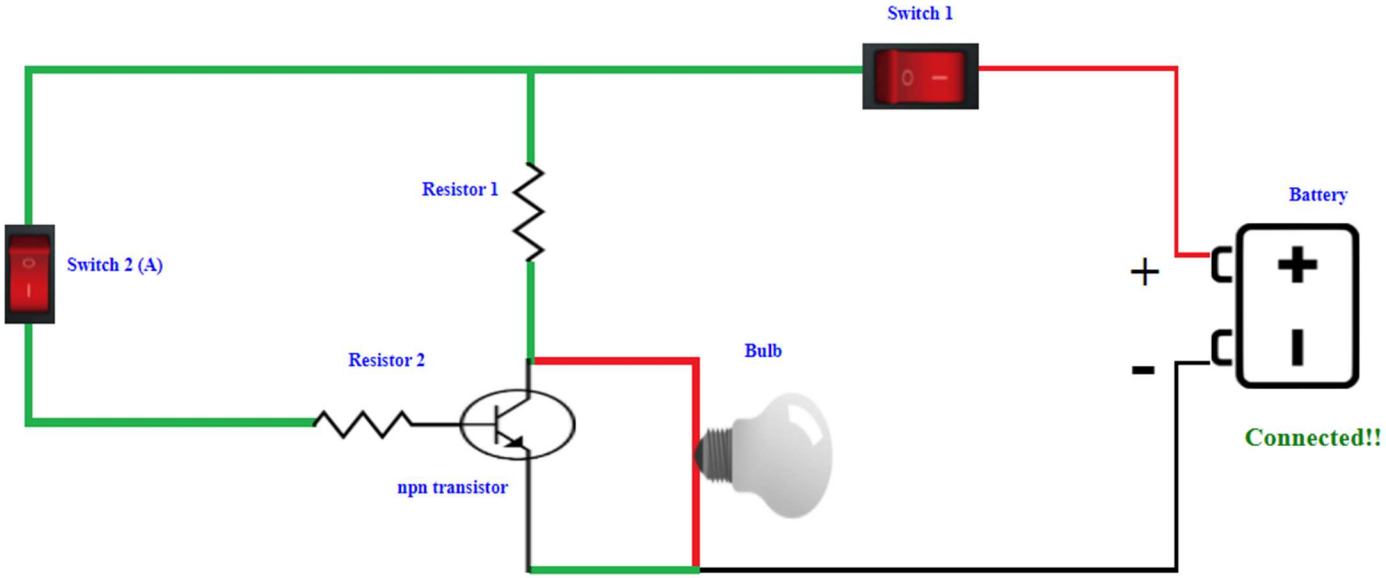
IC 7404

A	Y = A’
0	1
1	0

Truth table


Switch 1
Resistor 1
Battery
Switch 2 (A)
+
Resistor 2
Bulb
-
Connected!!
npn transistor

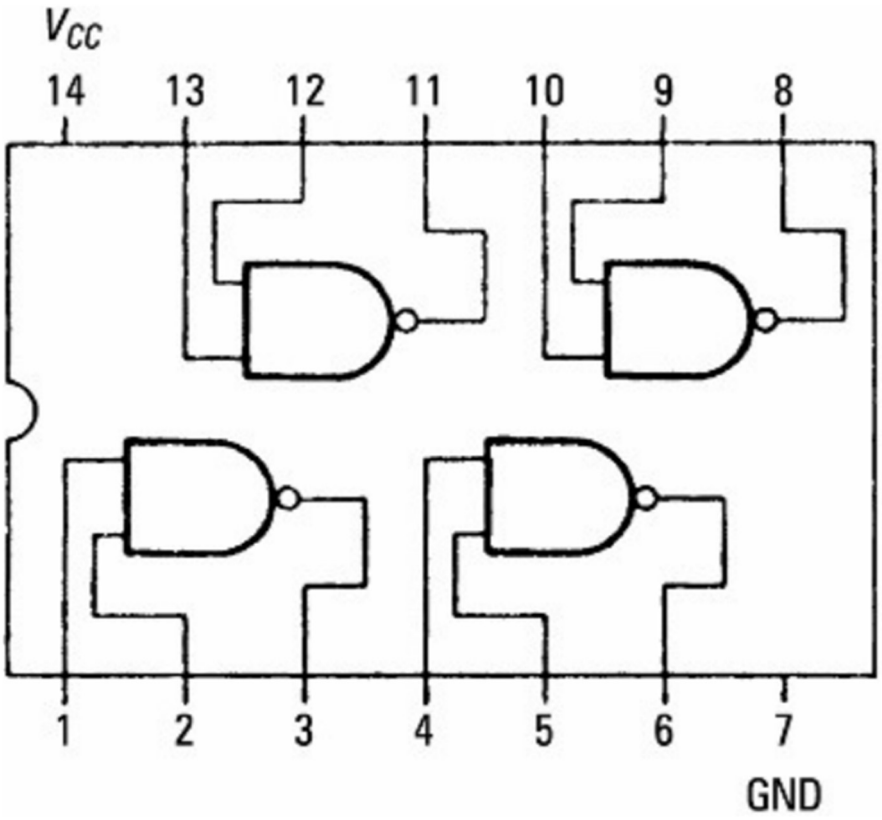
A = 0


Switch 1
Resistor 1
Battery
Switch 2 (A)
+
Resistor 2
Bulb
-
Connected!!
npn transistor

A = 1

NAND Gate

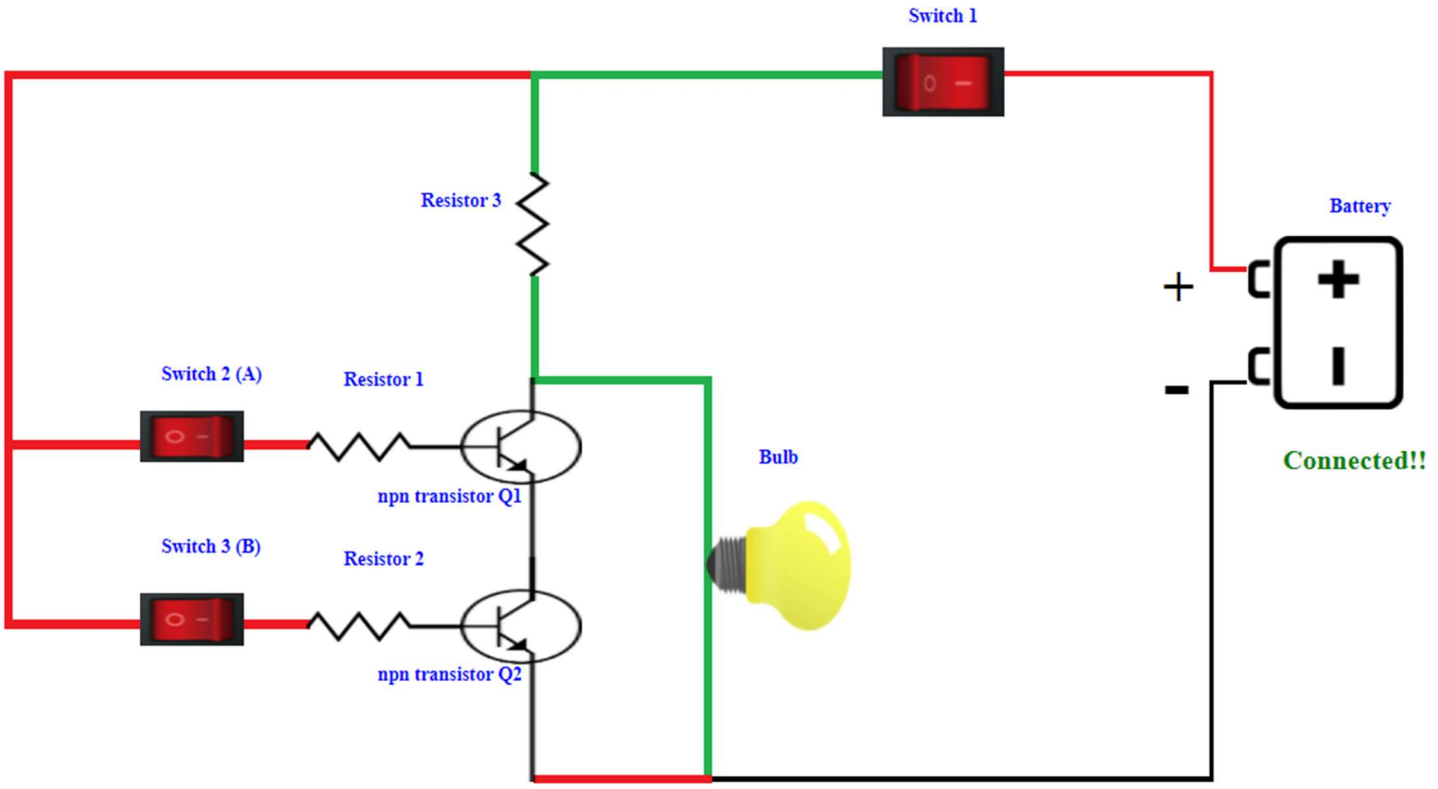
NAND gate is actually a series of AND gate with NOT gate. If we connect the output of an AND gate to the input of a NOT gate, this combination will work as NOT-AND or NAND gate. Its output is 1 when any or all inputs are 0, otherwise output is 1.



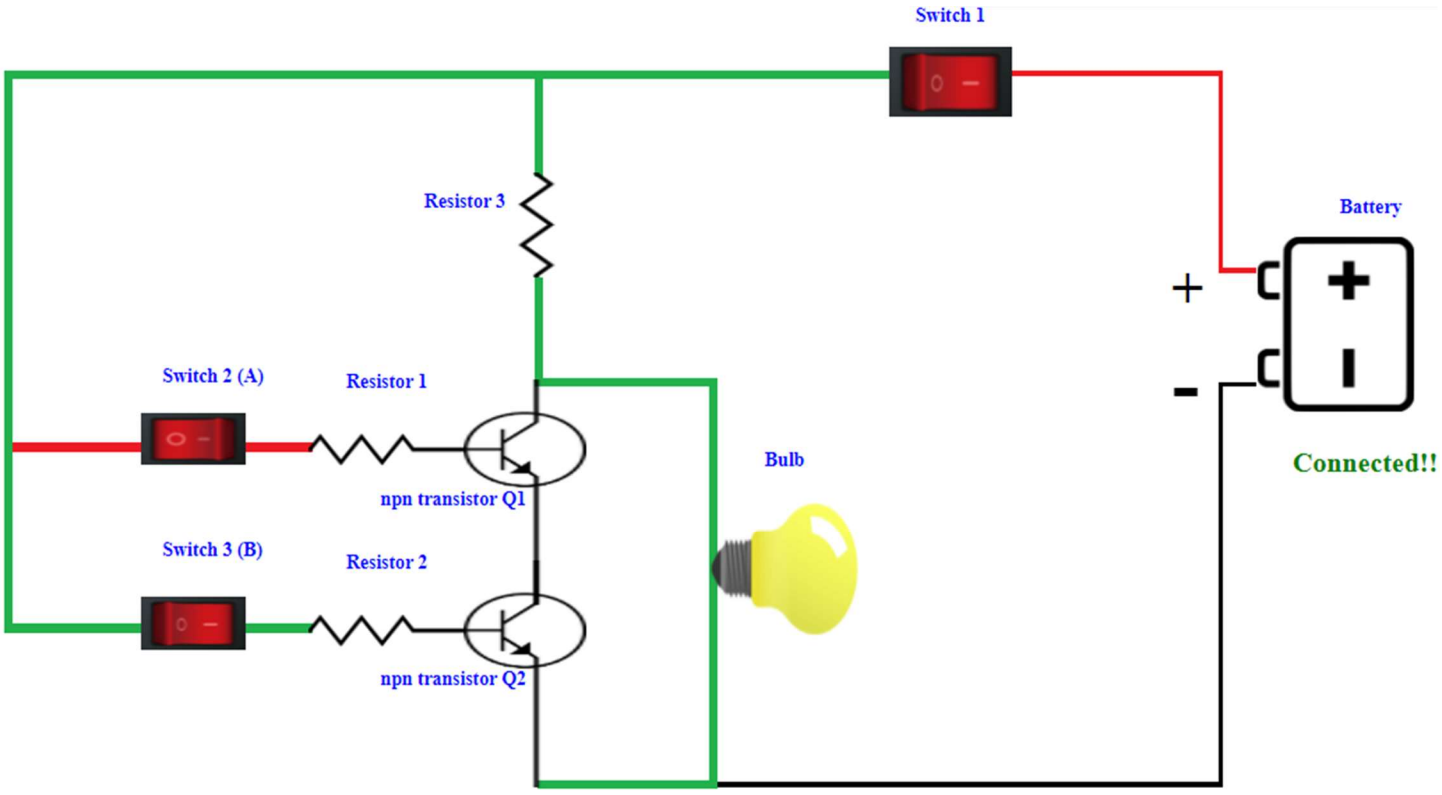
IC 7400

A	B	Y = (A.B)'
0	0	1
0	1	1
1	0	1
1	1	0

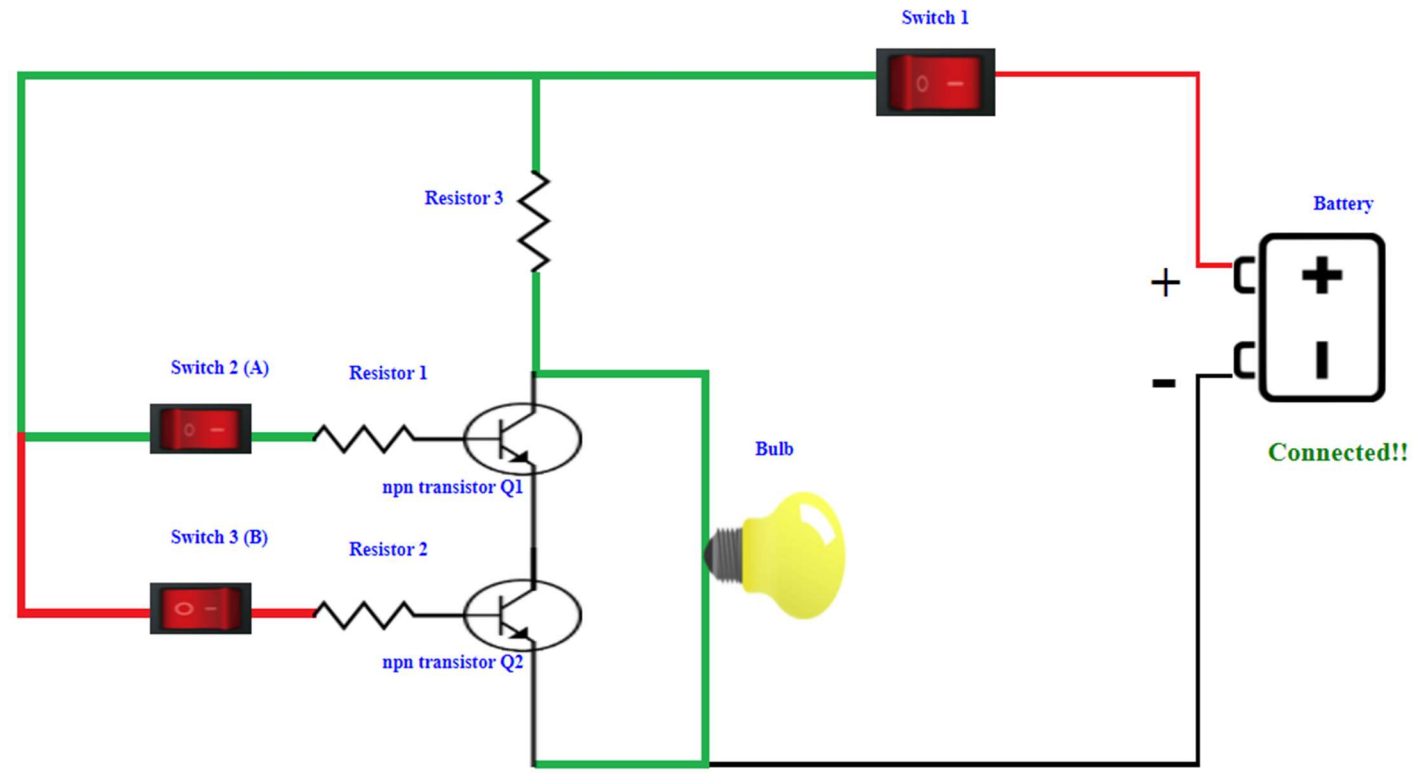
Truth table



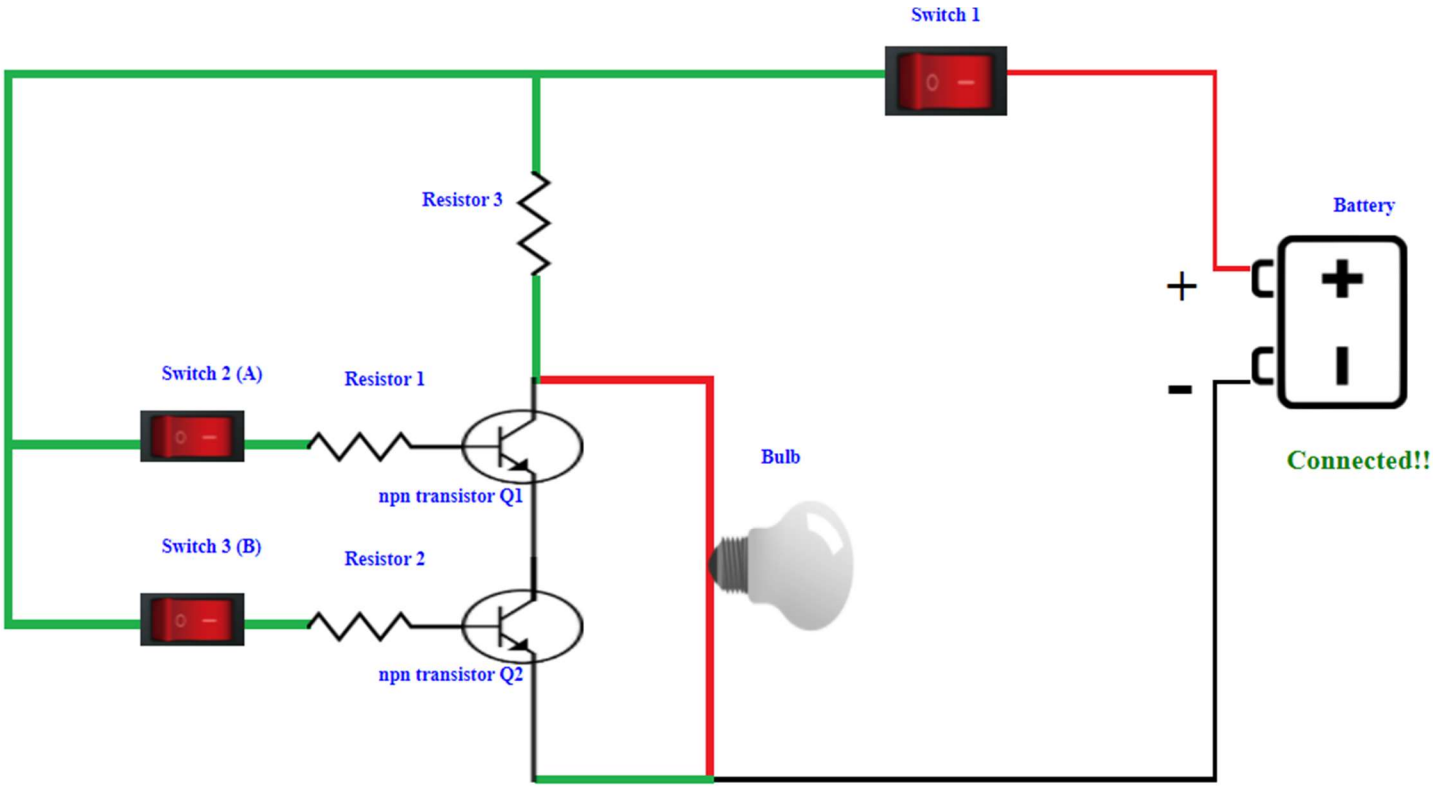
Both A and B are 0



A = 0 and B = 1



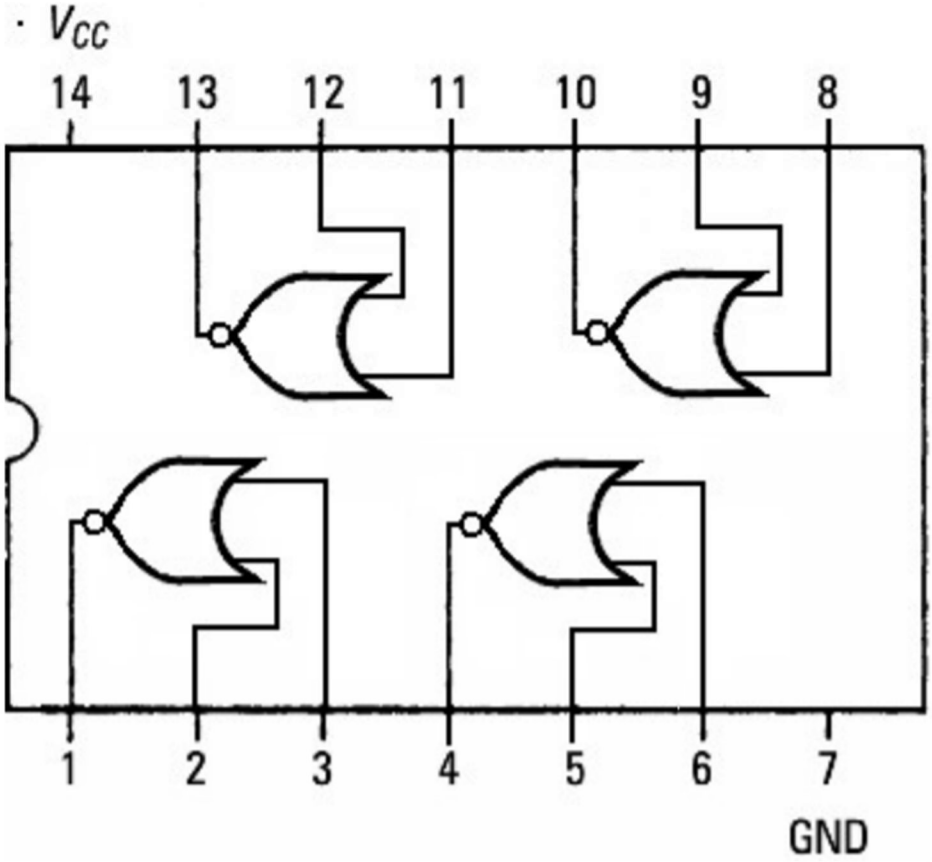
A = 1 and B = 0



Both A and B are 1

NOR Gate

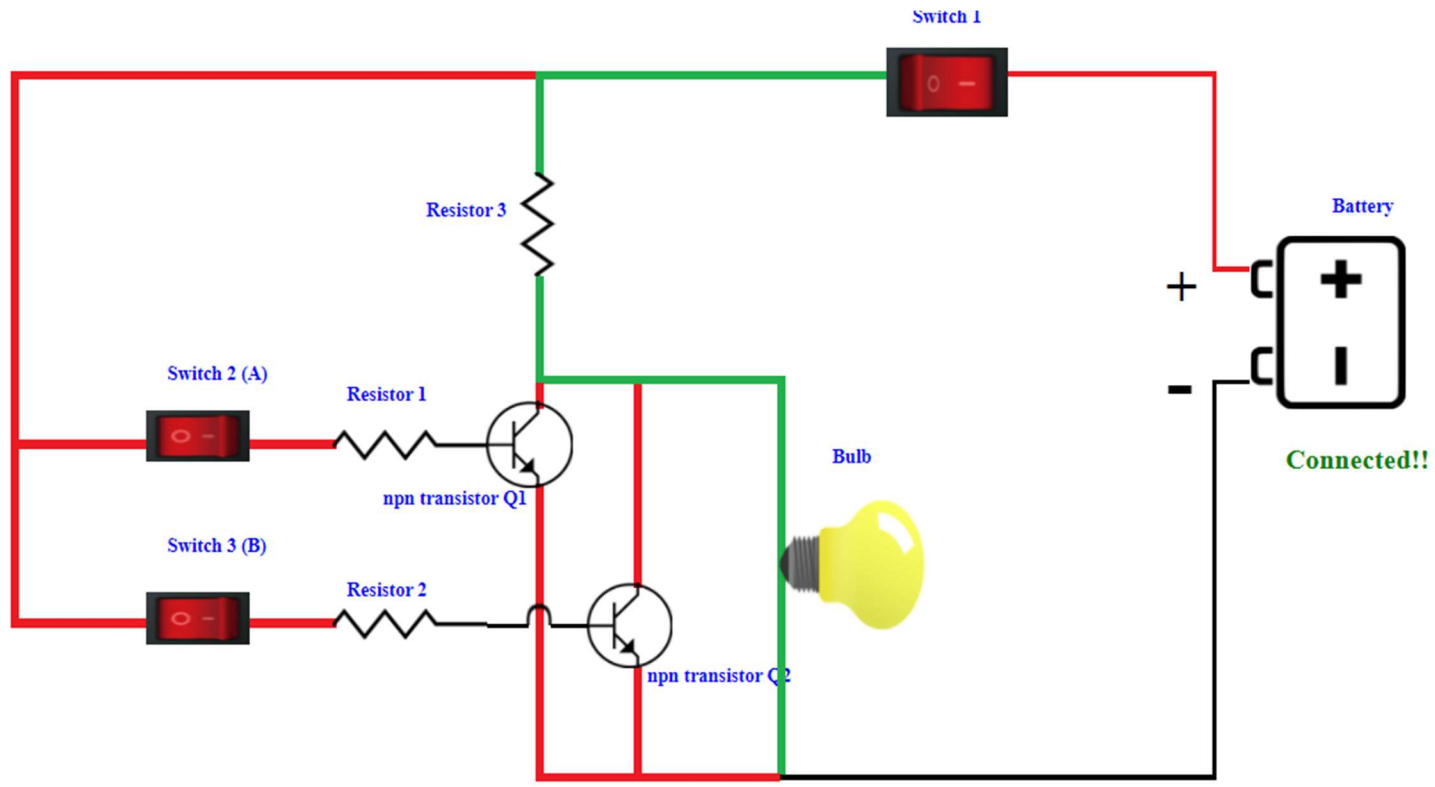
NOR gate is actually a series of OR gate with NOT gate. If we connect the output of an OR gate to the input of a NOT gate, this combination will work as NOT-OR or NOR gate. Its output is 0 when any or all inputs are 1, otherwise output is 1.



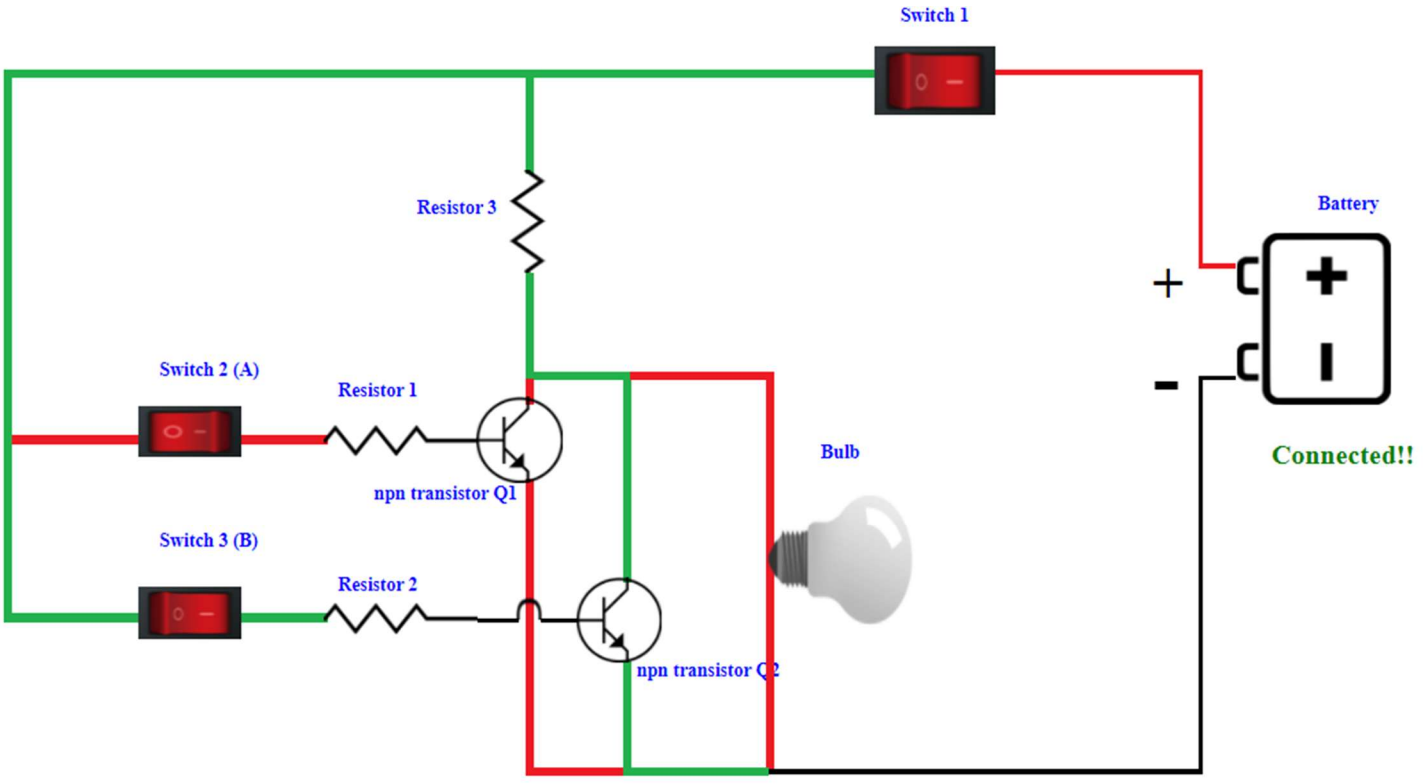
IC 7402

A	B	Y = (A+B)'
0	0	1
0	1	0
1	0	0
1	1	0

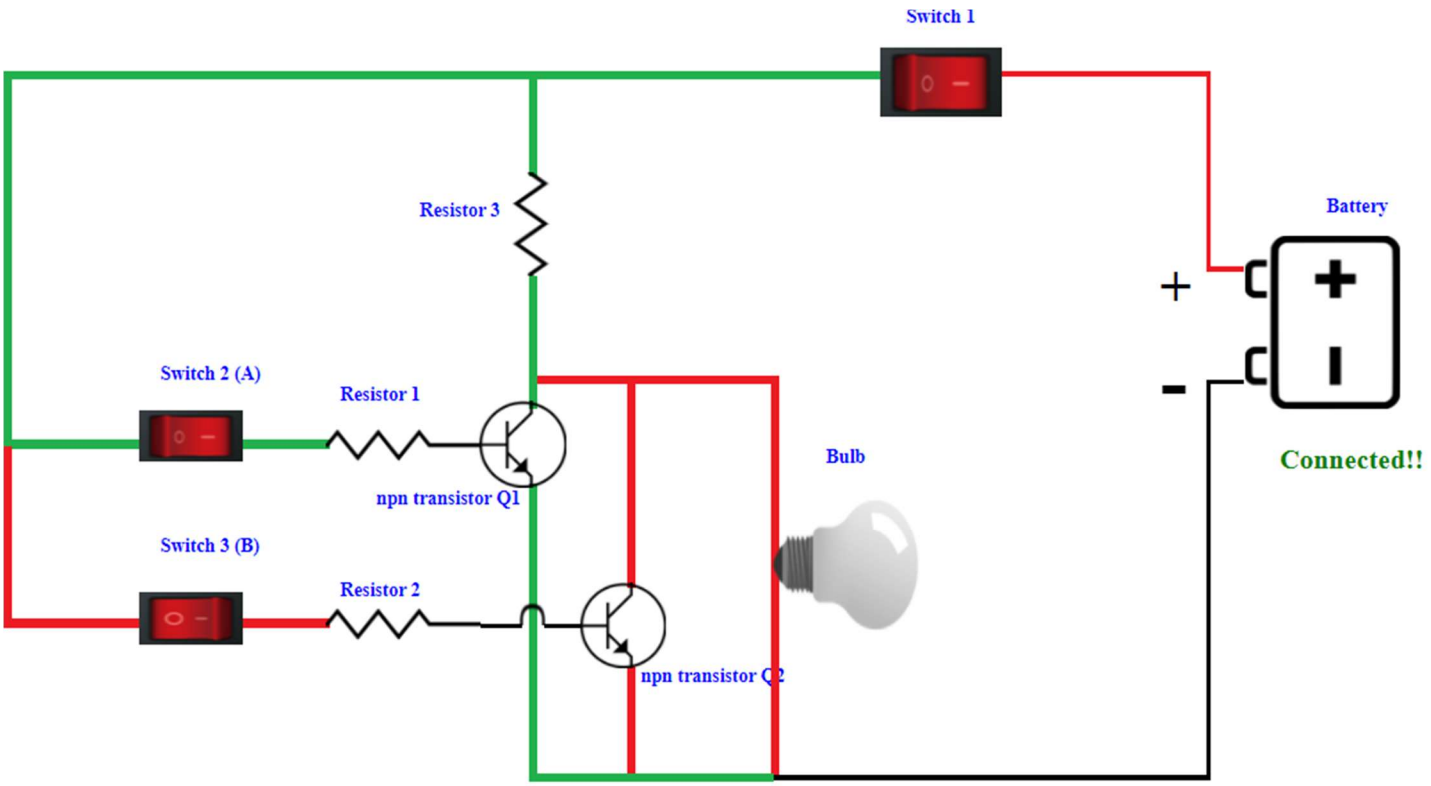
Truth table



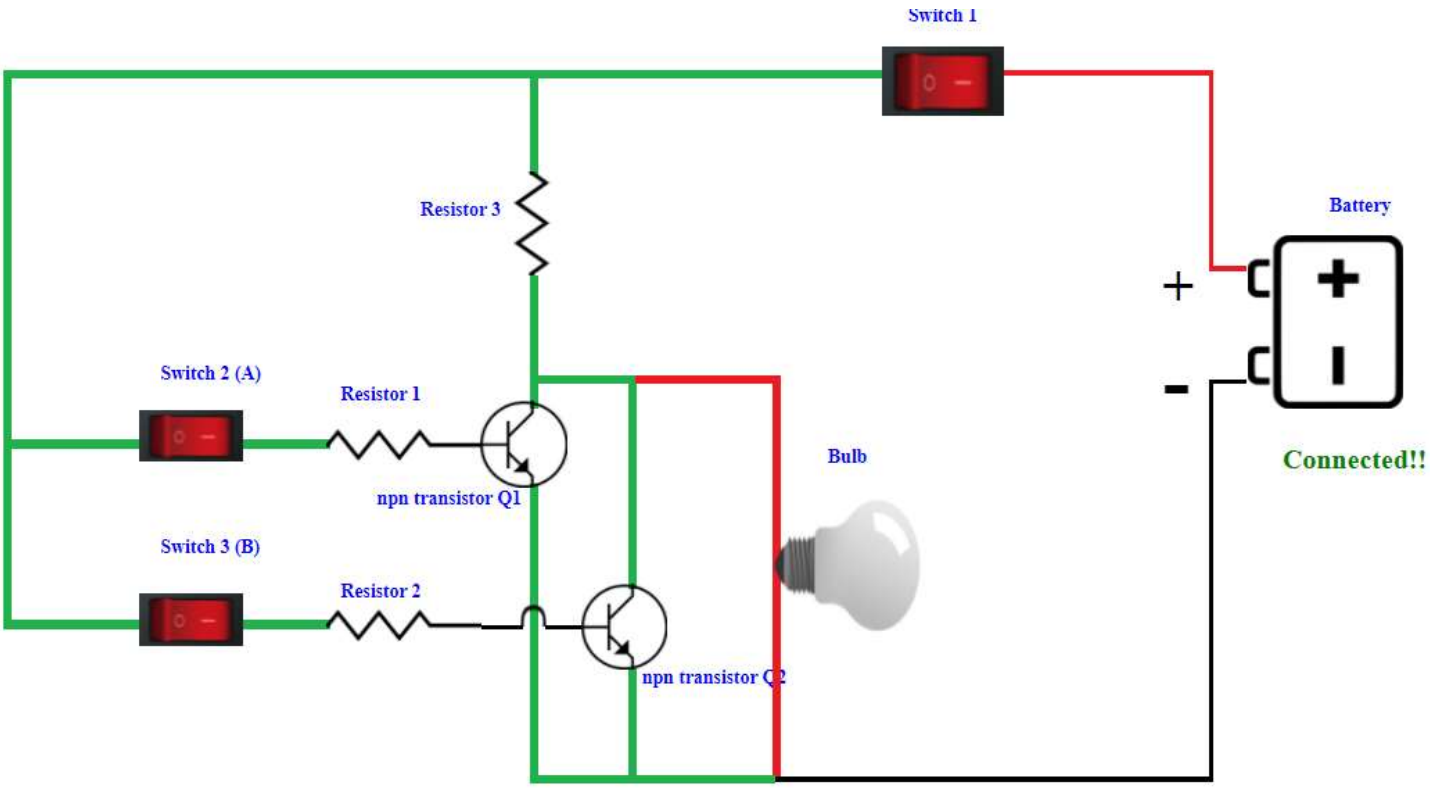
Both A and B are 0



A = 0 and B = 1



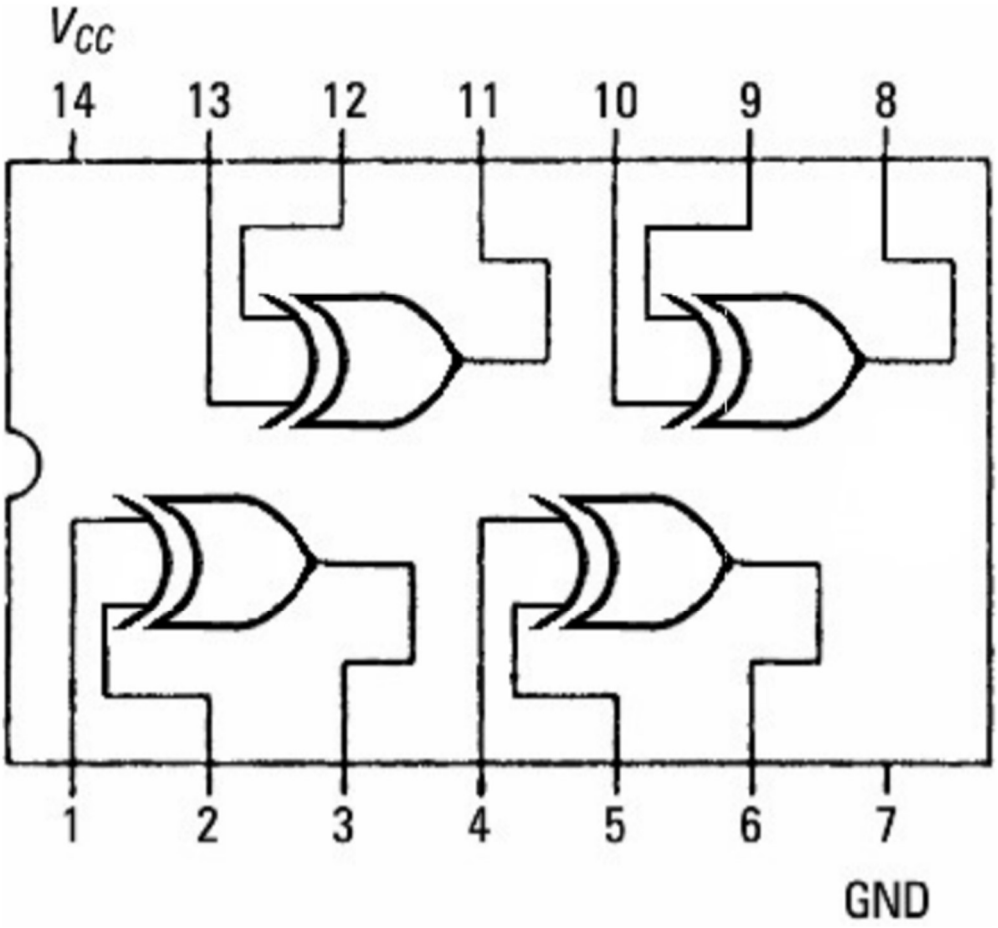
A = 1 and B = 0



Both A and B are 1

Exclusive OR (X-OR) Gate

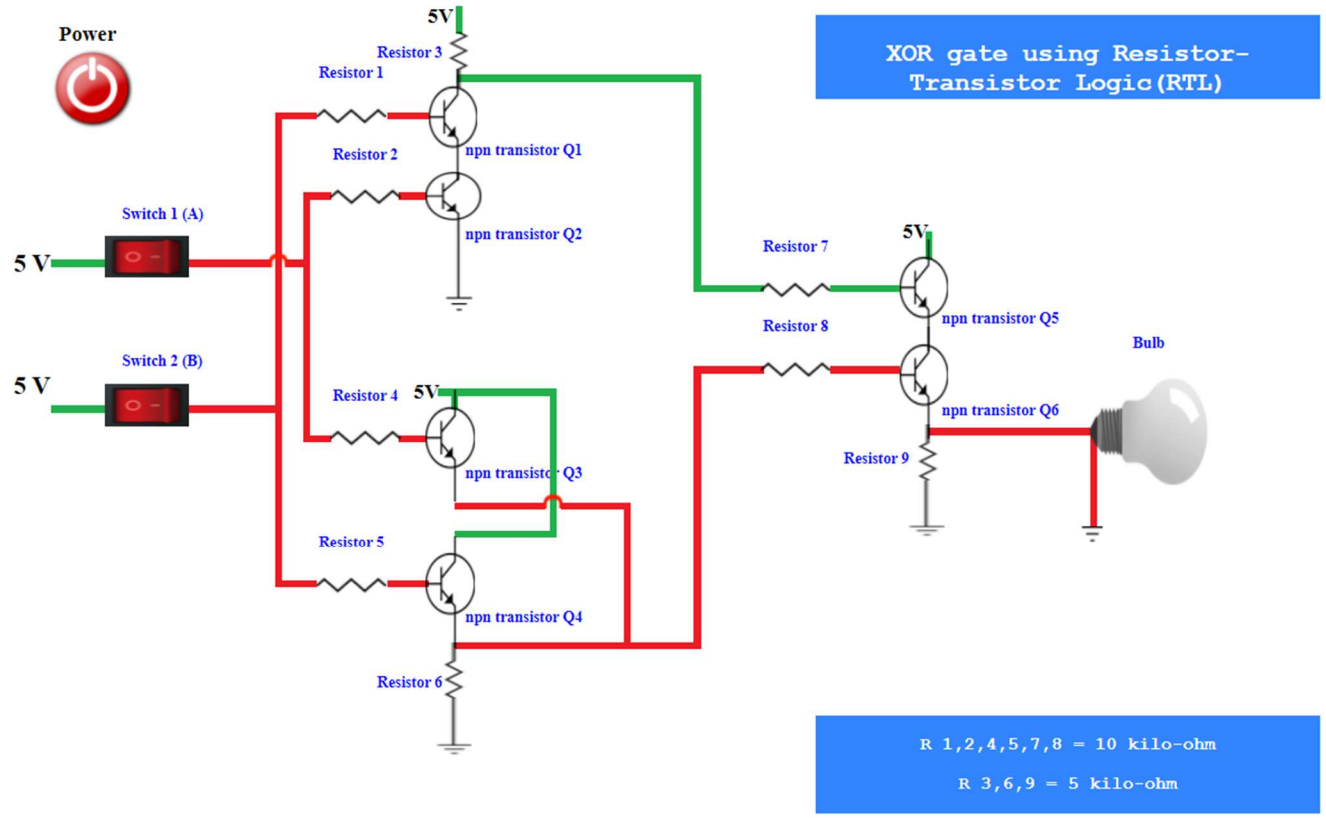
X-OR gate produces an output as 1, when number of 1's at its inputs is odd, otherwise output is 0. It has two inputs and one output.



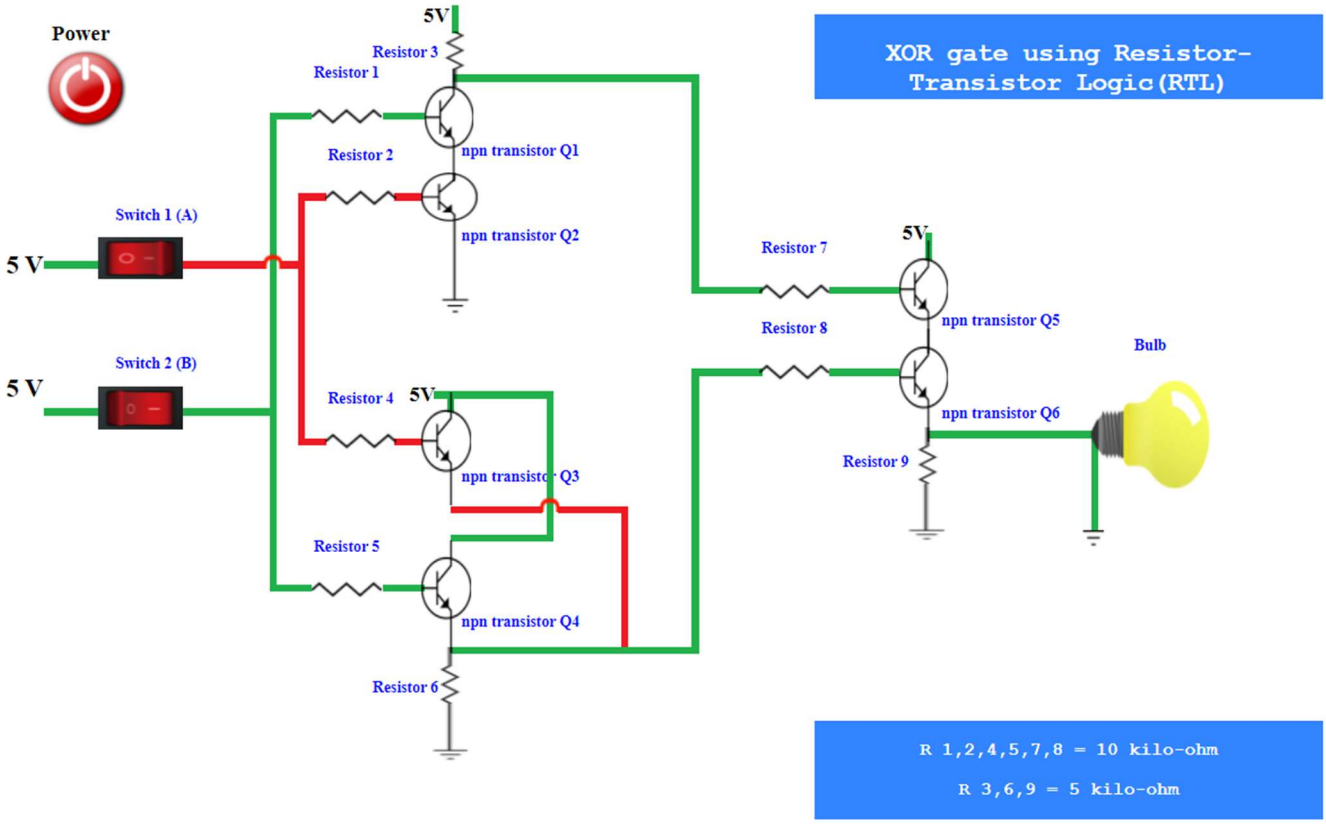
IC 7486

A	B	Y = A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

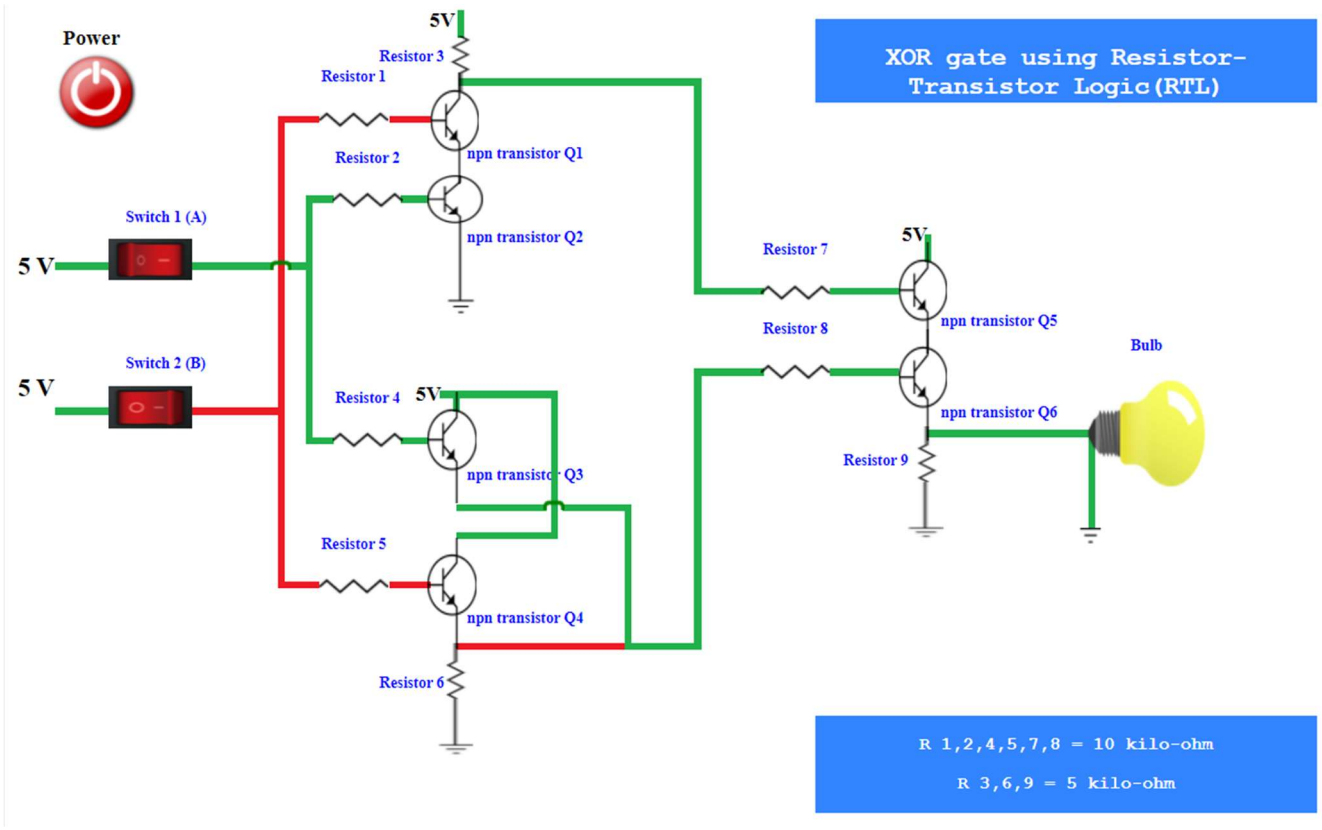
Truth table



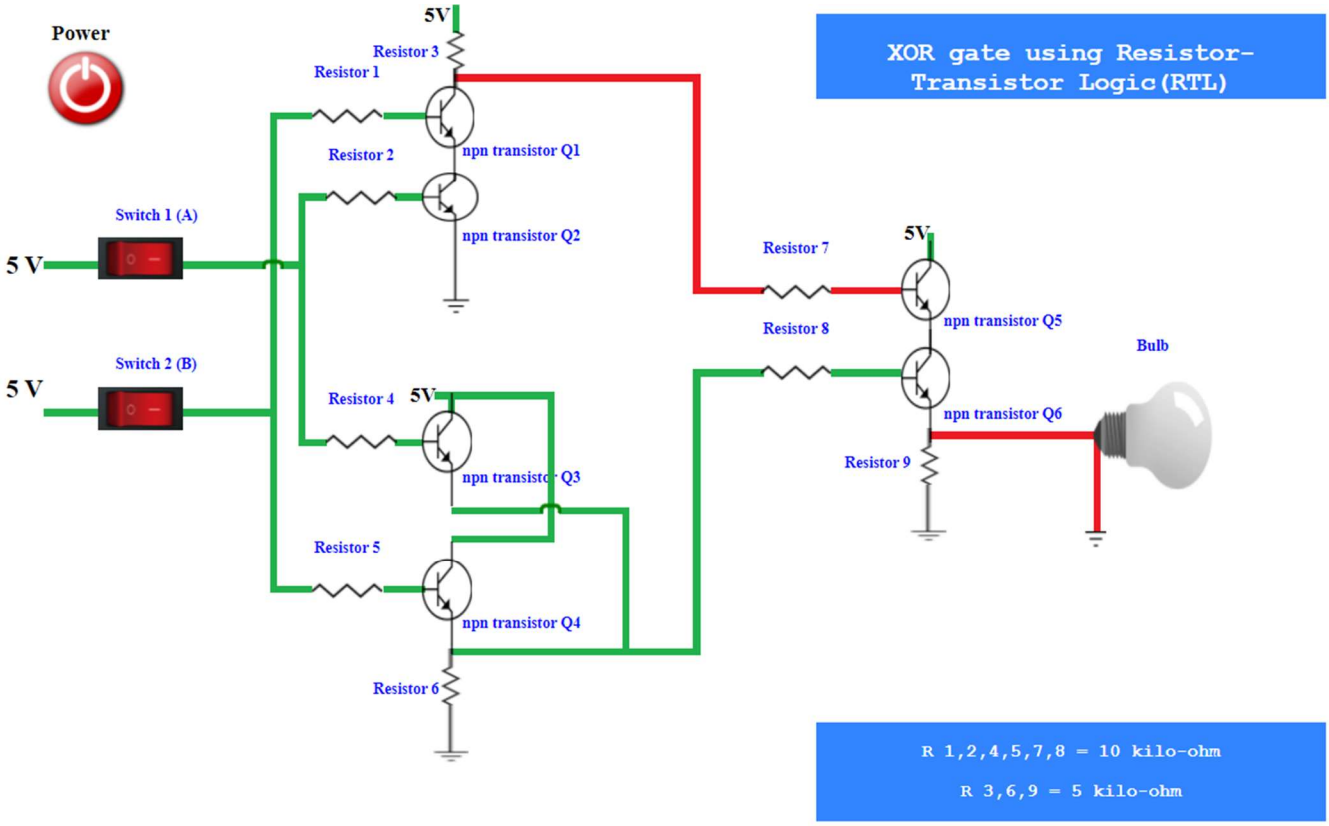
Both A and B are 0



A = 0 and B = 1



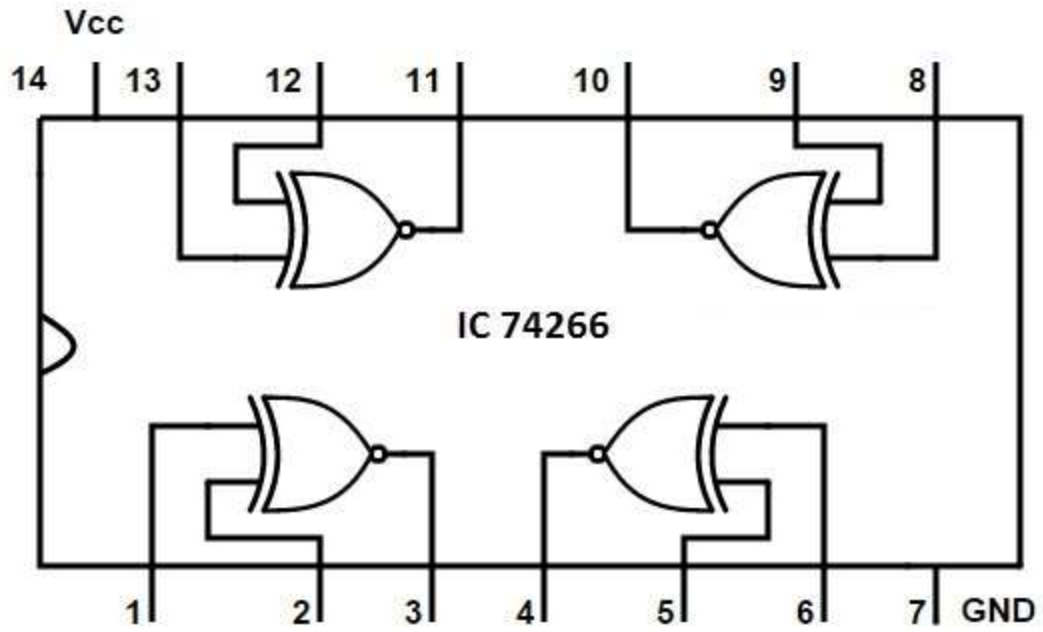
A = 1 and B = 0



Both A and B are 1

Exclusive NOR (X-NOR) Gate

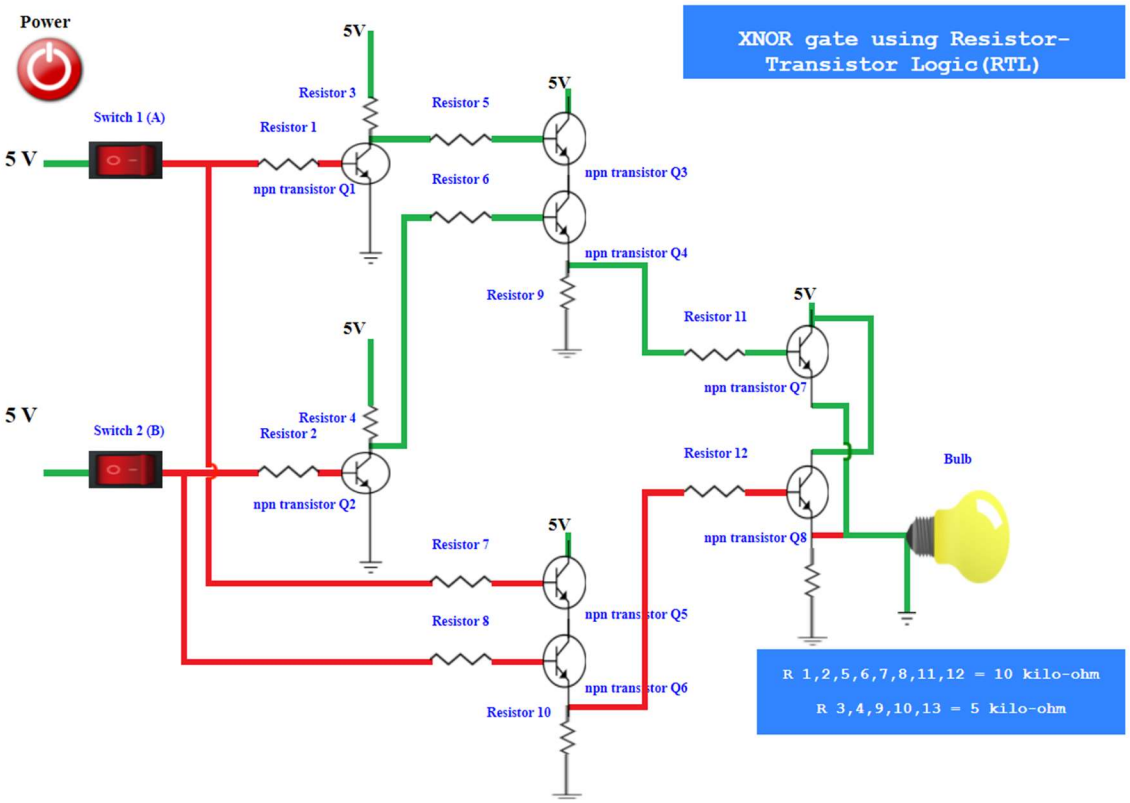
X-NOR gate produces an output as 1, when number of 1's at its inputs is not odd, otherwise output is 0. It has two inputs and one output.



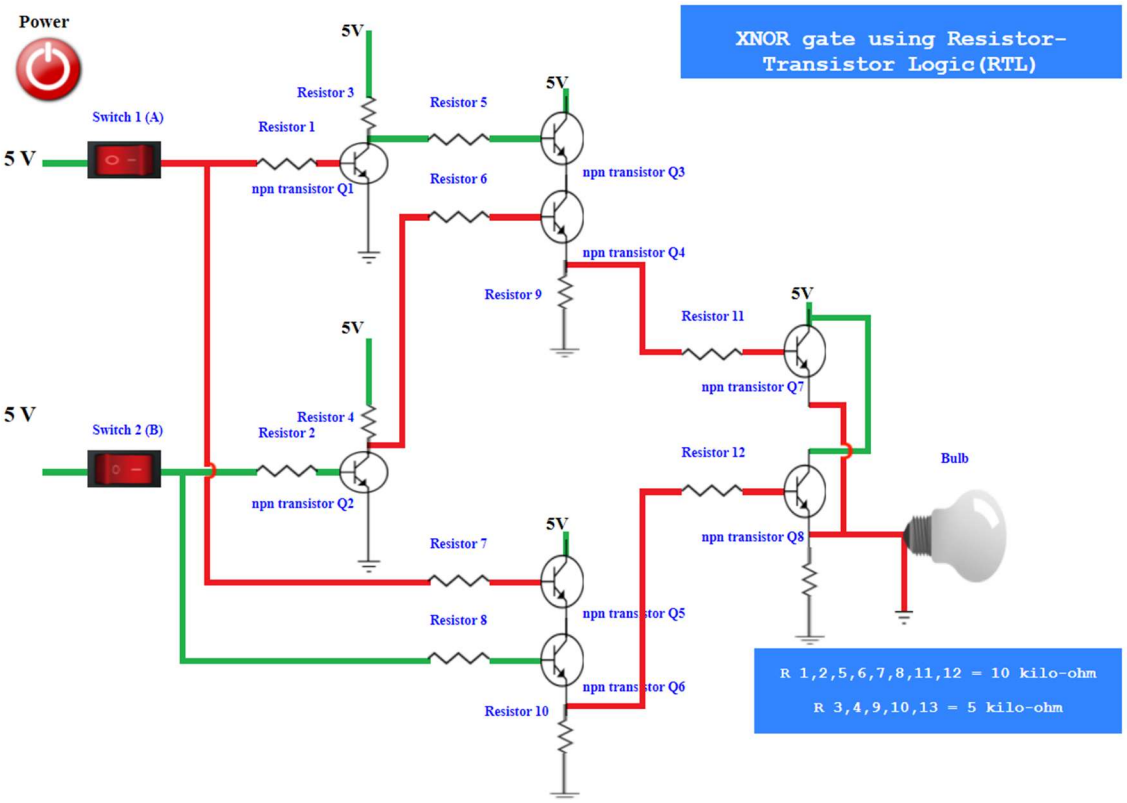
IC 74266

A	B	Y = A XNOR B
0	0	1
0	1	0
1	0	0
1	1	1

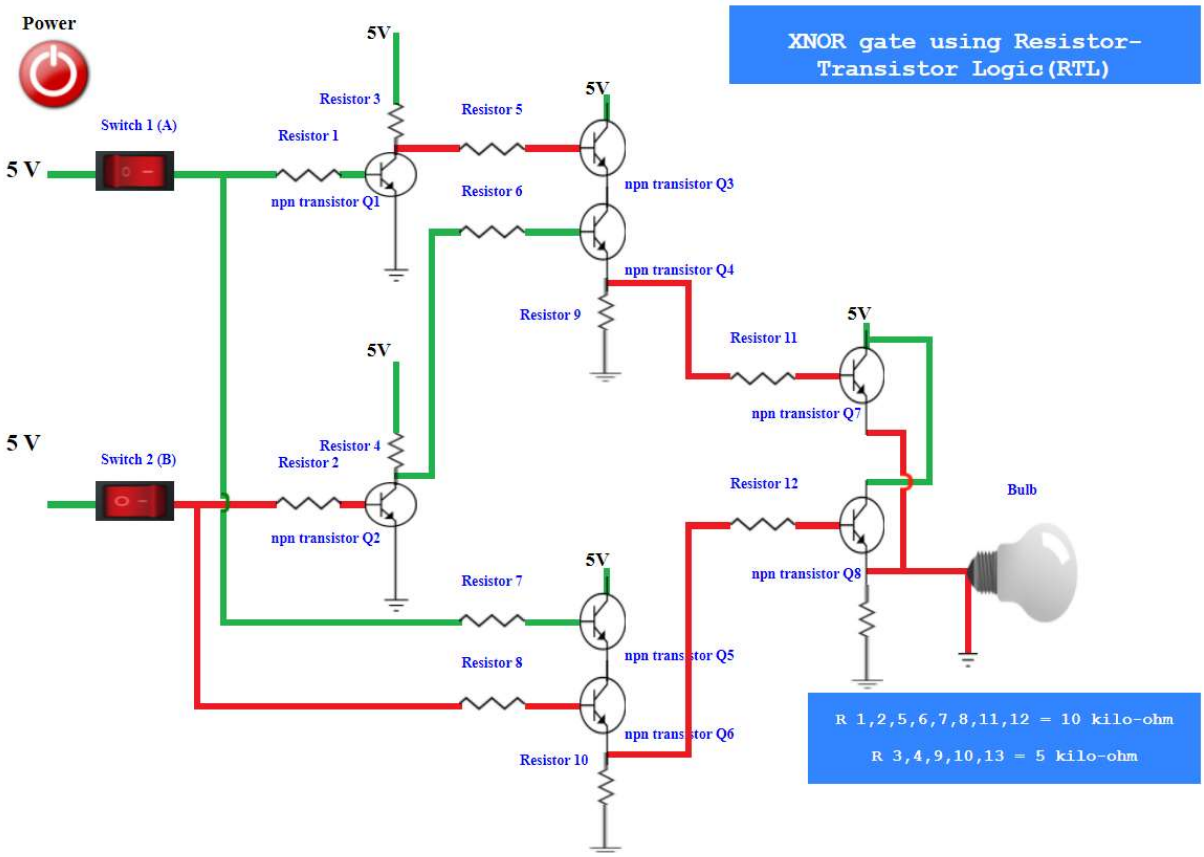
Truth table



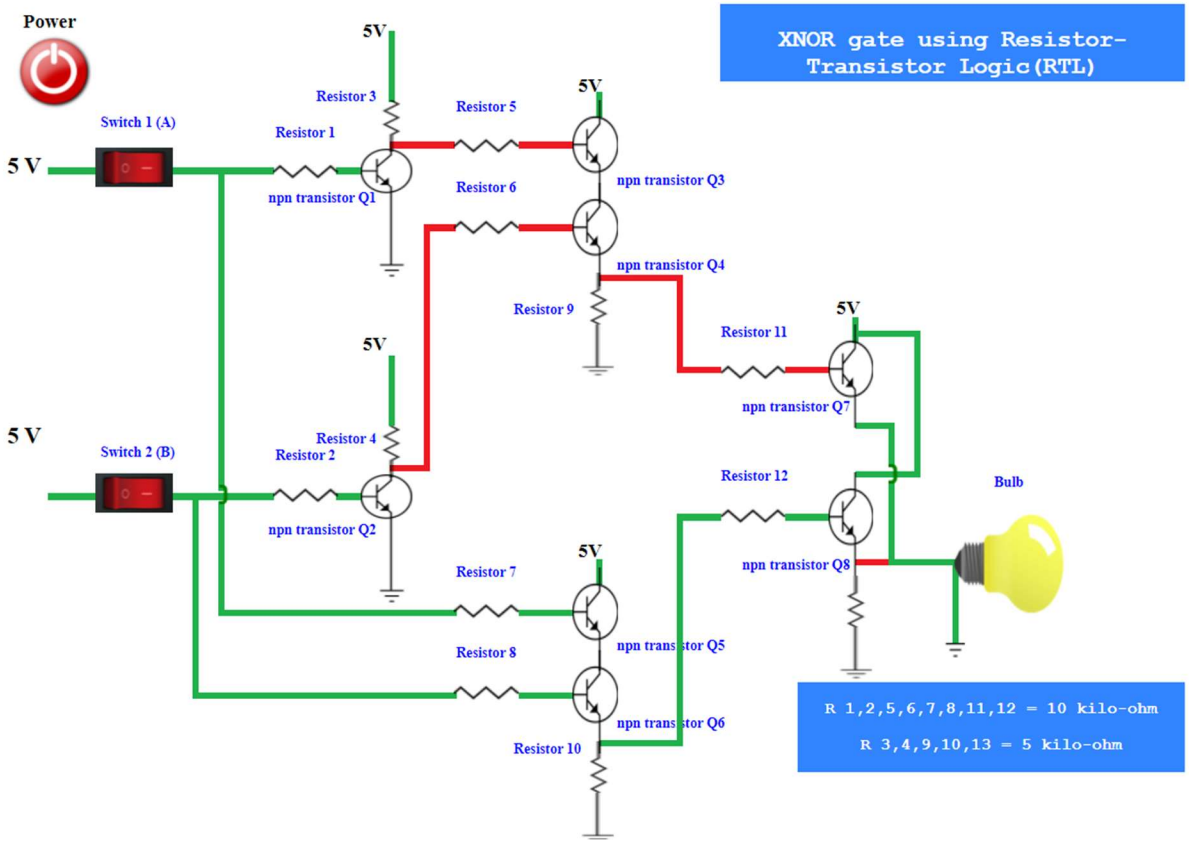
Both A and B are 0



A = 0 and B = 1



A = 1 and B = 0



Both A and B are 1