EXPERIMENT NO:-2

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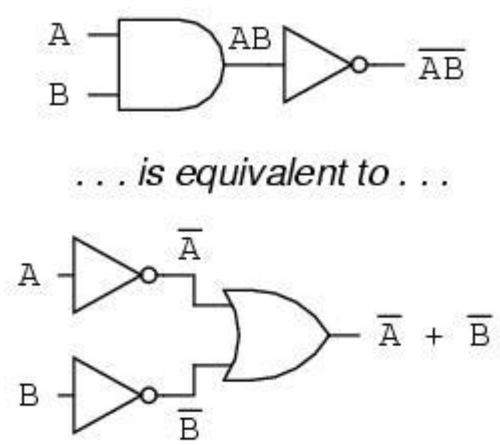
- **AIM*:*** To verify the De'Morgan's Theorems.

- **APPARATUS :**

  - IC 7400 : Quad - Dual input NAND Gate
  - IC 7402 : Quad – Dual input NOR Gate
  - IC 7408 : Quad – Dual input AND Gate
  - IC 7432 : Quad – Dual input OR gate
  - IC 7404 : Hex – Not gate

- **THEORY:**

Inverting all inputs to a gate reverses that gate's essential function from AND to OR, or vice versa, and also inverts the output. So, an OR gate with all inputs inverted (a Negative-OR gate) behaves the same as a NAND gate, and an AND gate with all inputs inverted (a Negative-AND gate) behaves the same as a NOR gate. DeMorgan's theorems state the same equivalence in "backward" form: that inverting the output of any gate results in the same function as the opposite type of gate (AND vs. OR) with inverted inputs:



$$\overline{AB} = \overline{A} + \overline{B}$$

[A] Statement and Proof of De'Morgan's First Law**:**

The complement of sum is equal to the product of compliments of complements of individuals variable

[B] Statement and proof of De'Morgan's second Law :

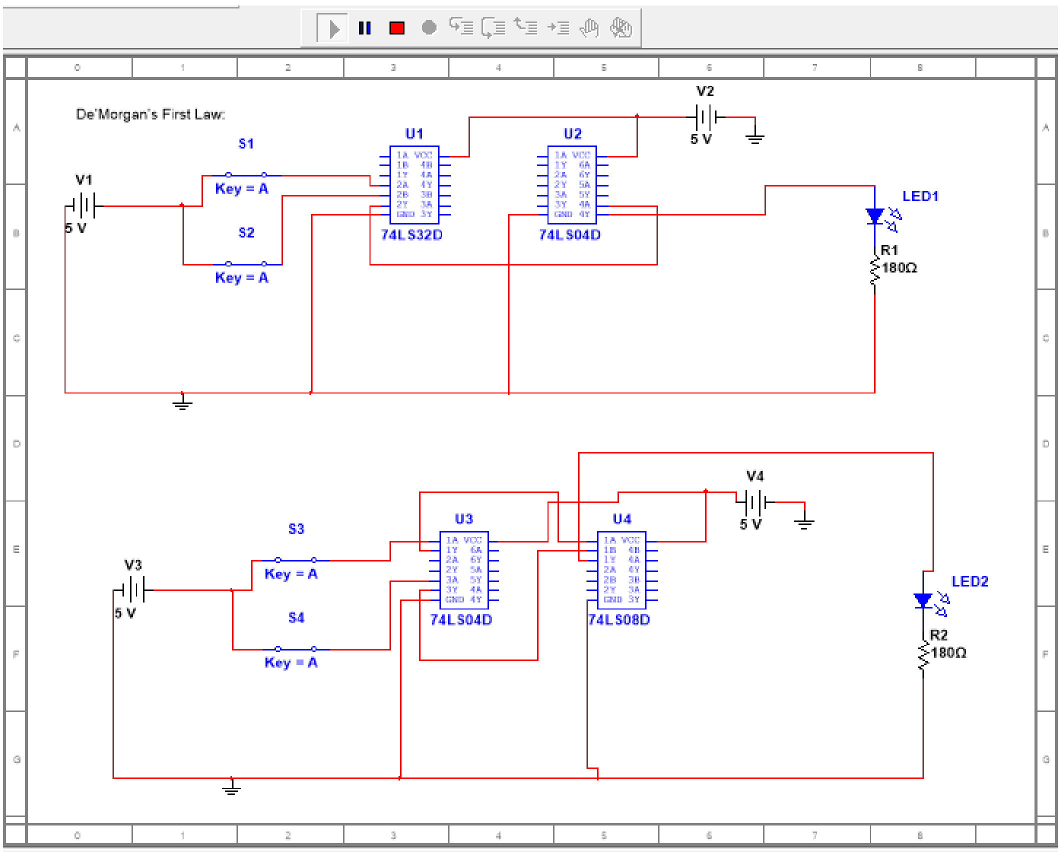
The compliment of the product is equal to the sum of compliment of individual variables

➤ **PROCEDURE:**

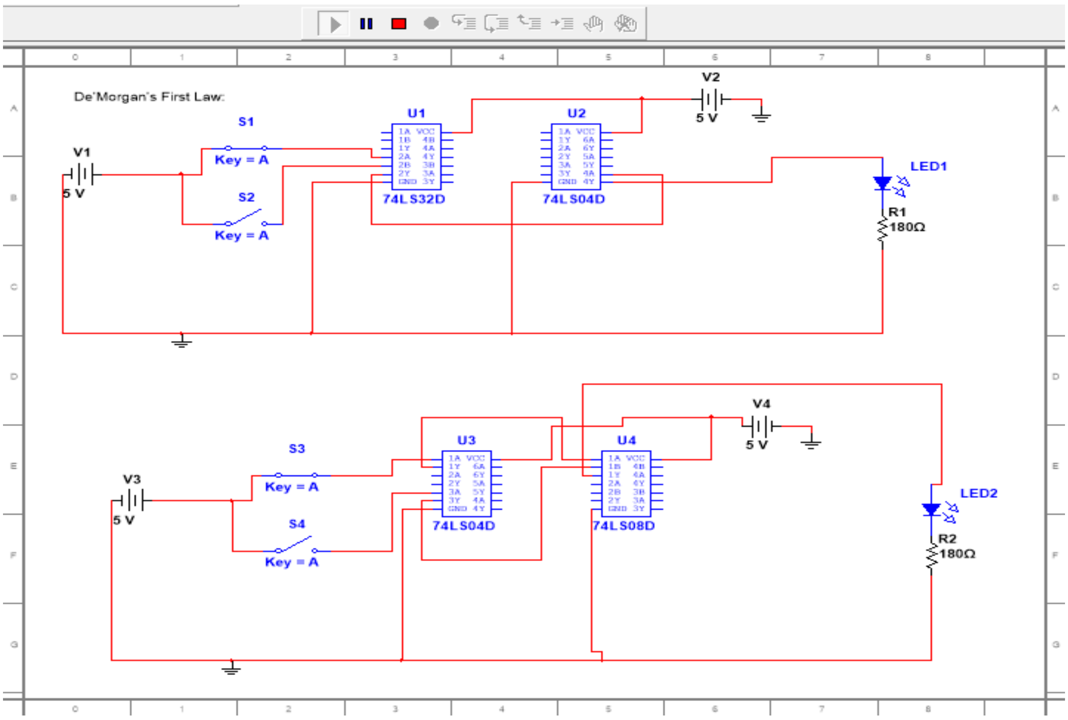
1. Connect the circuit on the bread board using ICs.
2. Switch ON the power supply.
3. Test the truth table of different gates by changing the input levels (i.e. '1' means HIGH & '0' means LOW) and check the level of output voltage.(if LED glows it is at level '1' and if LED doesn't glow output is at level '0').
4. Verify that the De'Morgan's laws are proved.

For De'Morgan's First Law:

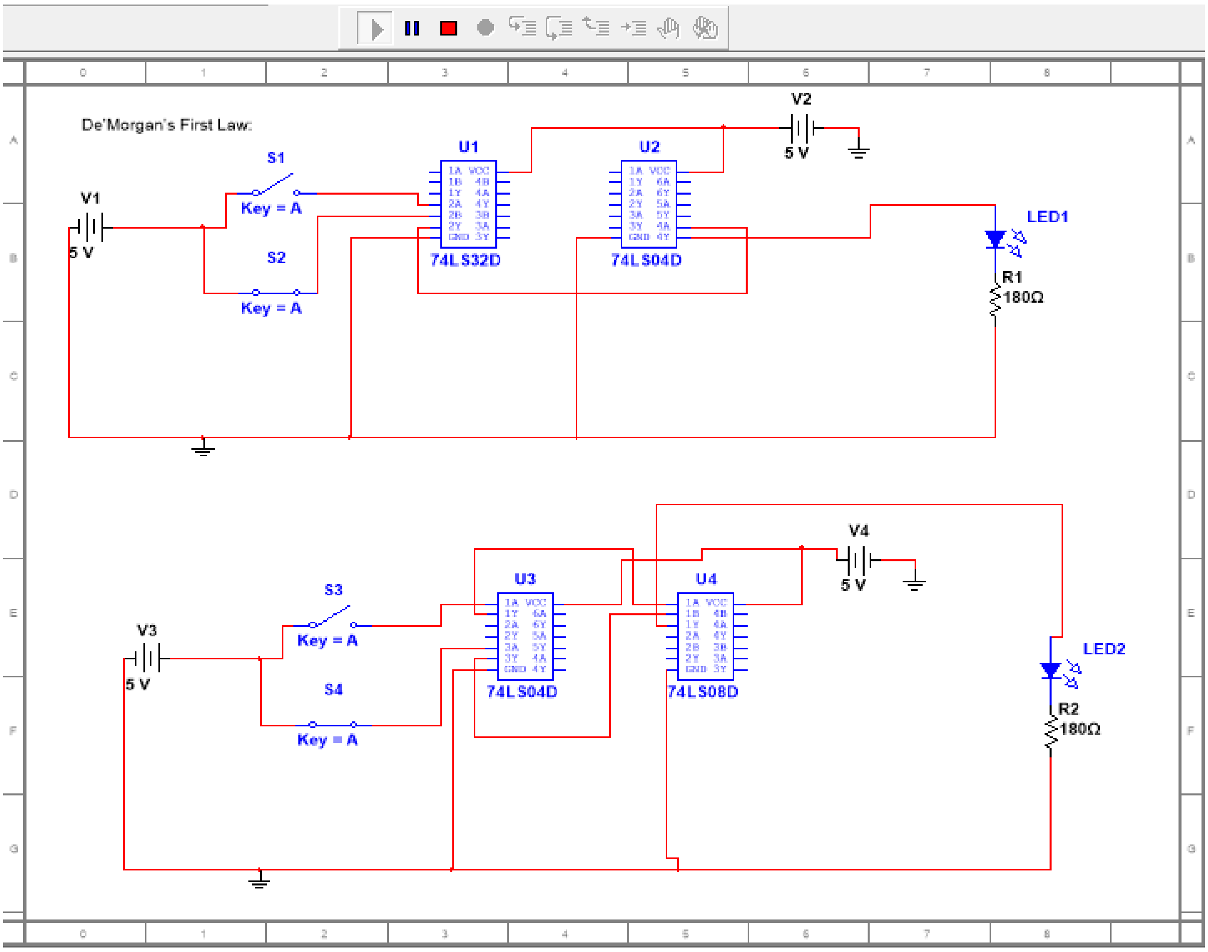
<u>When Input A=1 & B=1 Output will be:-</u>



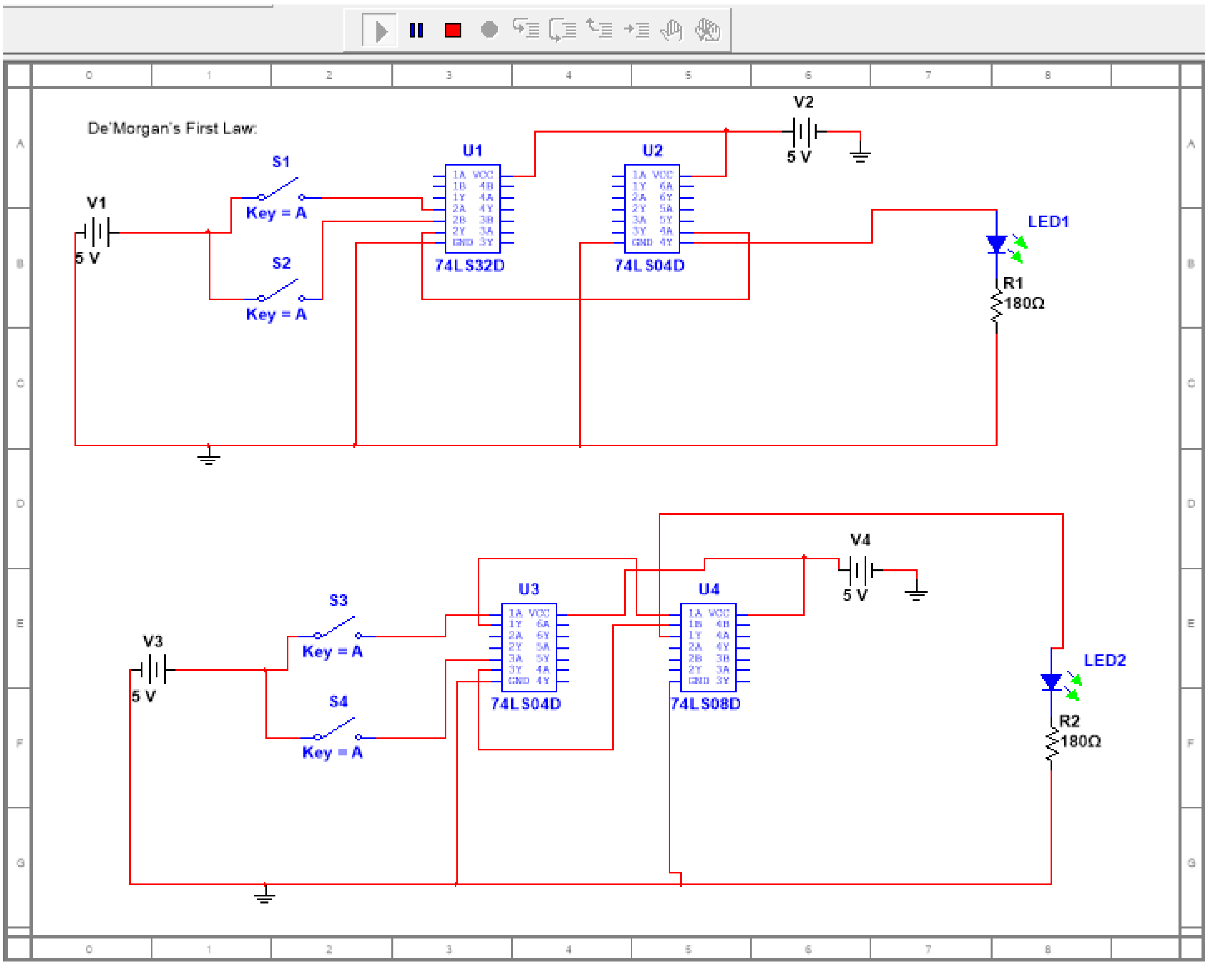
__**When Input A=1 & B=0 Output will be:-**__



__**When Input A=0 & B=1 Output will be:-**__

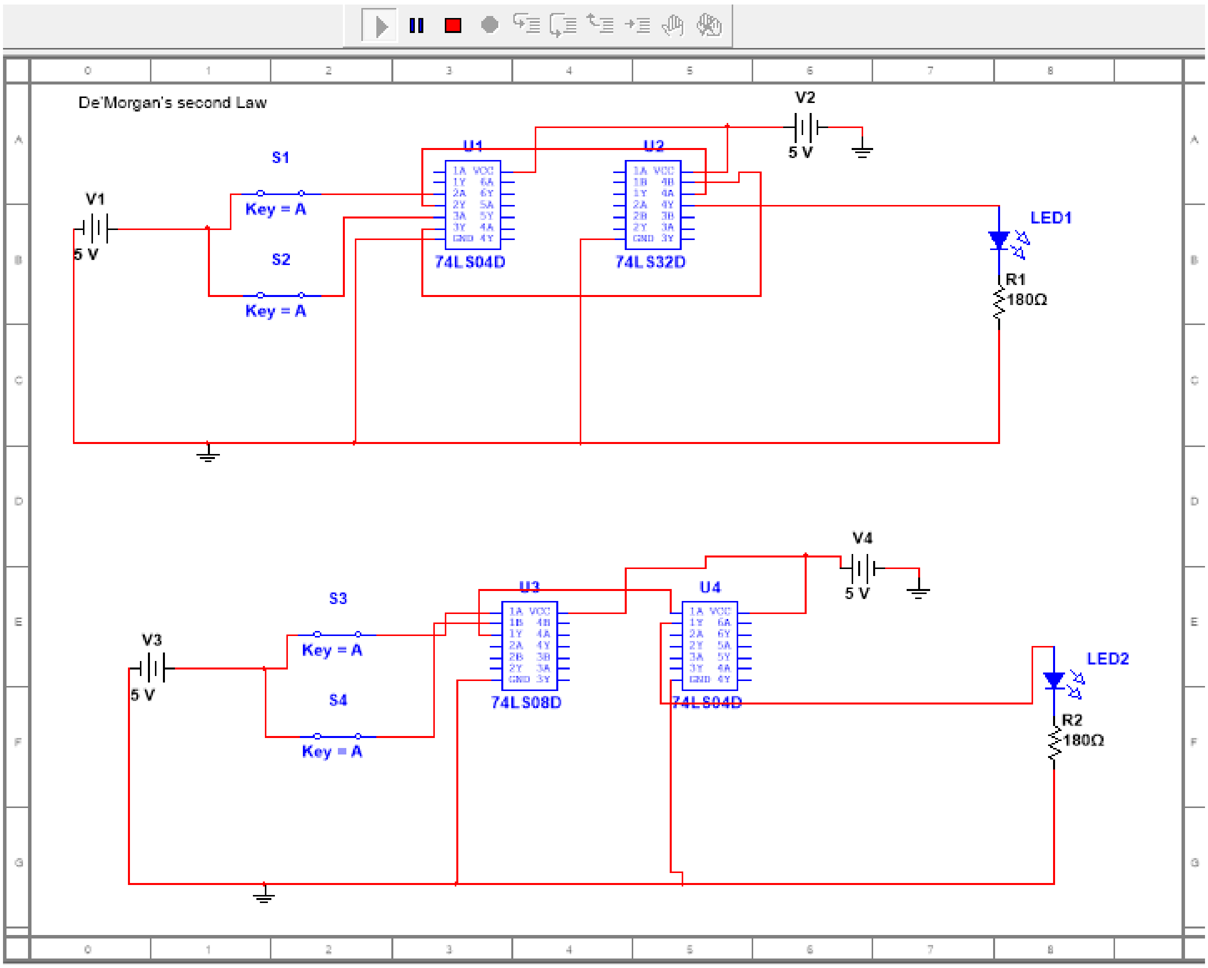


When Input A=0 & B=0 Output will be:-

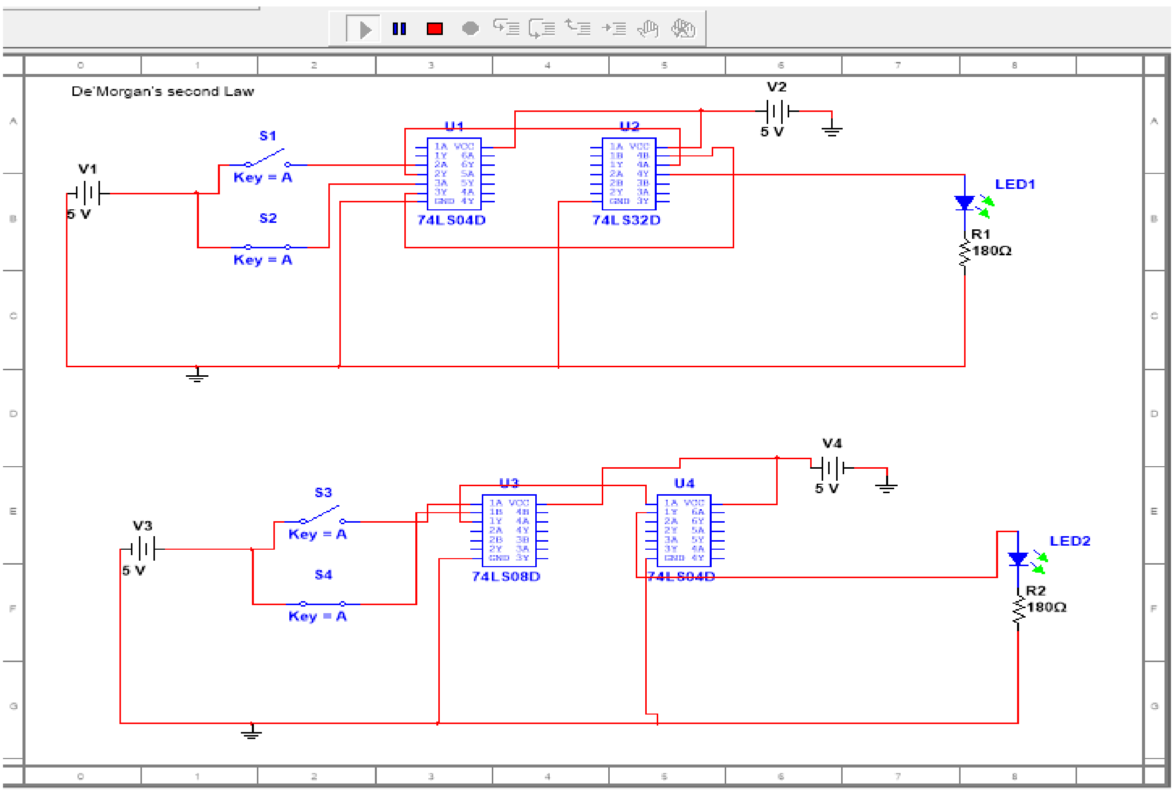


For De'Morgan's Second Law:-

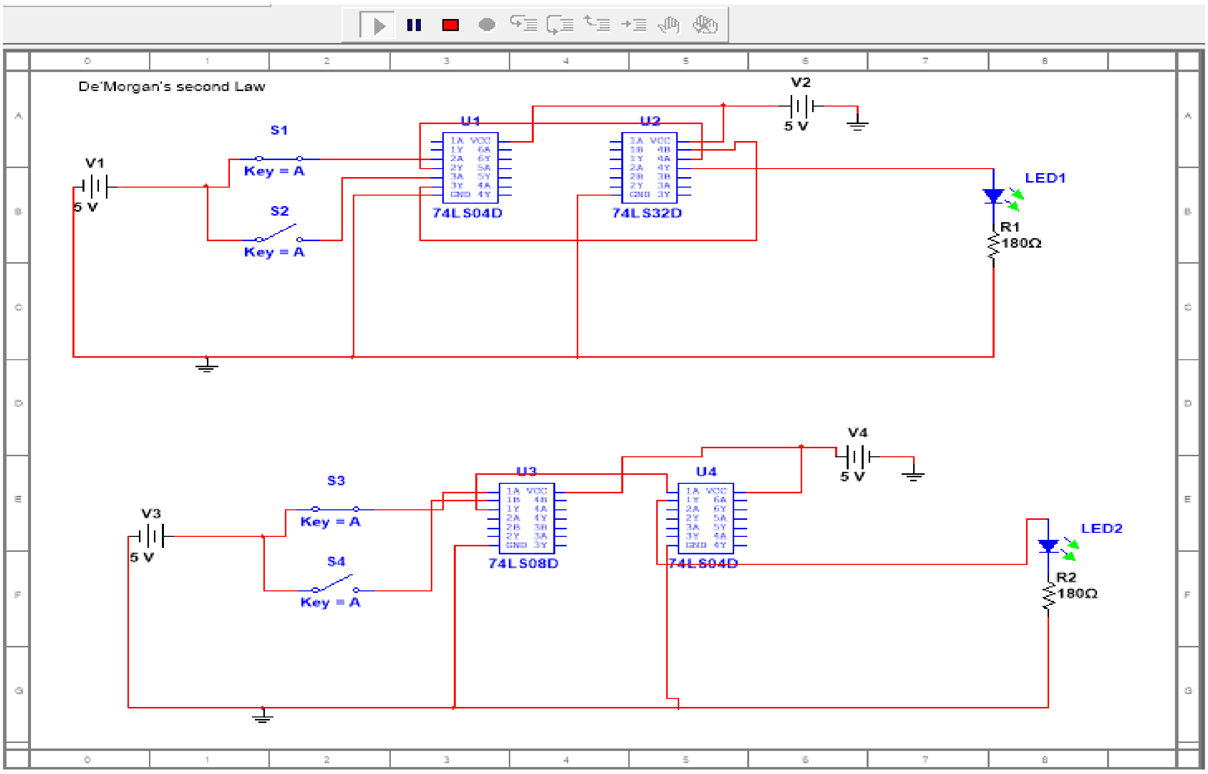
When Input A=0 & B=0 Output will be:-



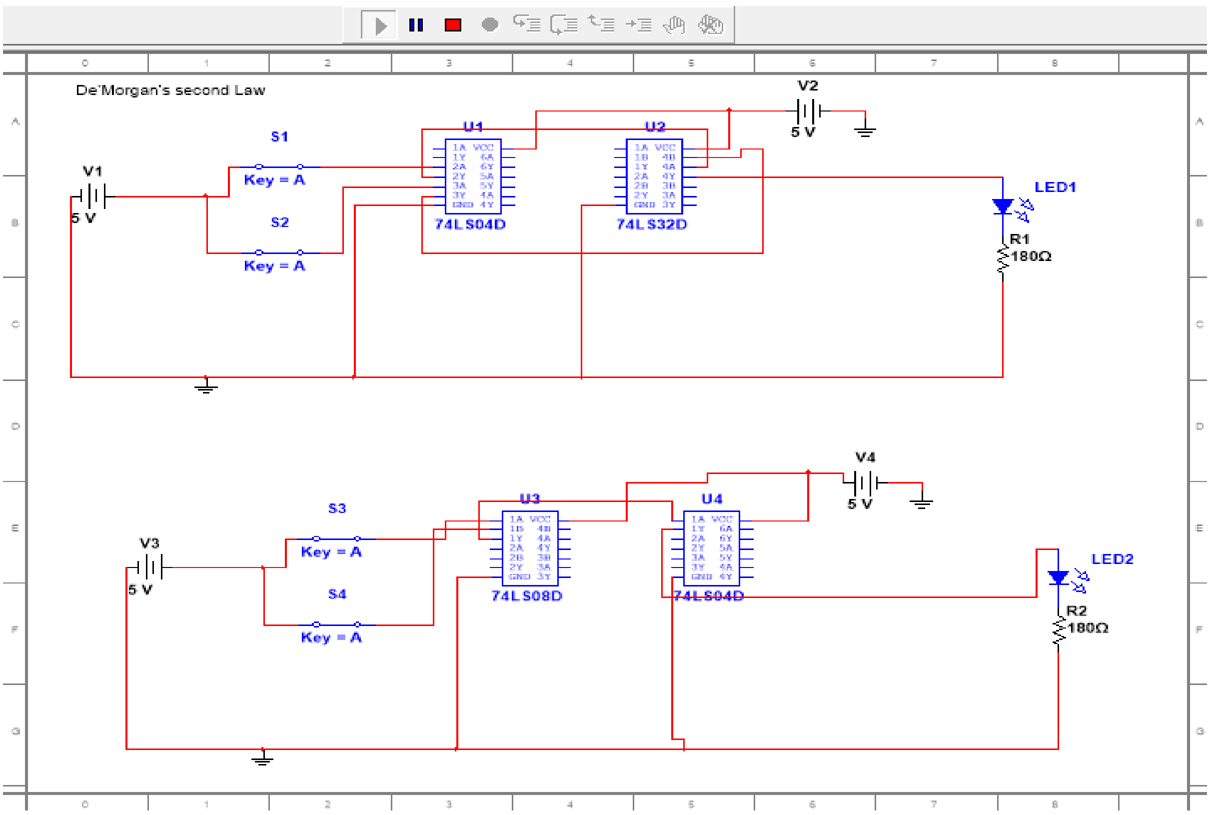
When Input A=0 & B=1 Output will be:-



When Input A=1 & B=0 Output will be:-



When Input A=1 & B=1 Output will be:-



- **CONCLUSION:**

By performing this practical, we have proved De Moragan's law by using IC's, logic gates, and truth tables.