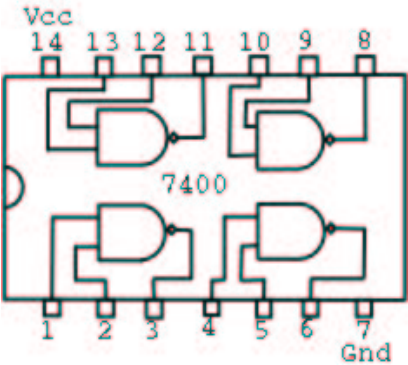


# LABORATORY EXERCISE # 2

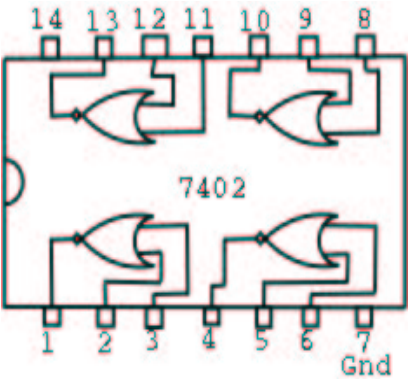
<b>TITLE</b>	<b>STUDY OF BASIC GATES</b>
<b>AIM</b>	To study basic gates.
<b>APPARATUS</b>	Power Supply, Breadboard, Connecting Wires.
<b>COMPONENTS</b>	ICs 7400, 7402, 7404, 7408, 7432, 7486, DIP Switch and LEDs.

**IC PINOUTS**

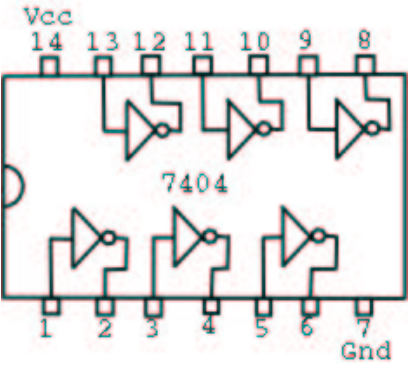


**TRUTH/FUNCTION TABLE**

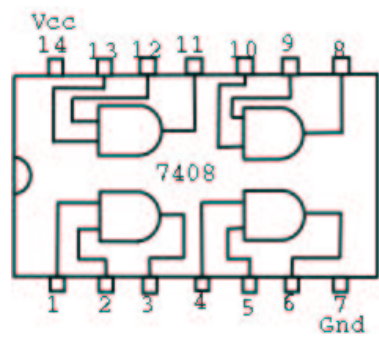
NAND		
A	B	$Y = \overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0



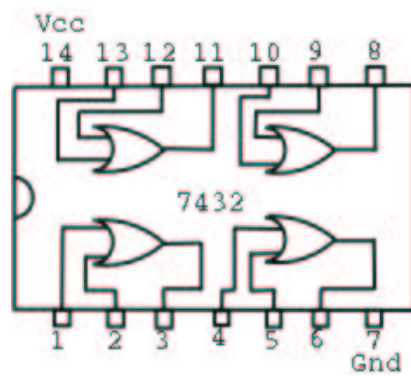
NOR		
A	B	$Y = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0



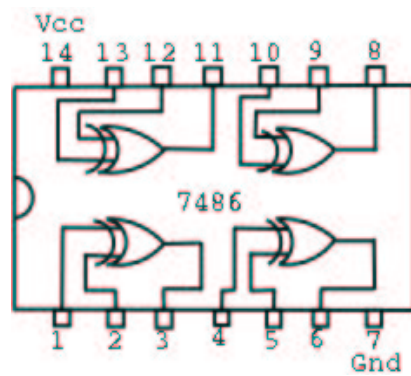
NOT	
A	$Y = \overline{A}$
0	1
1	0



AND		
A	B	$Y=A.B$
0	0	0
0	1	0
1	0	0
1	1	1



OR		
A	B	$Y=A+B$
0	0	0
0	1	1
1	0	1
1	1	1



EX-OR		
A	B	$Y=\overline{A}B+A\overline{B}$
0	0	0
0	1	1
1	0	1
1	1	0

## THEORY

Logic gates are the digital circuits with one output and one or more inputs. They are the basic building blocks of any logic circuit. Different logic gates are : **AND, OR, NOT, NAND, NOR, EX-OR.**

Digital circuits have two discrete voltage levels to represent the binary digits (bits) 1 and 0. All digital circuits are switching circuits. Instead of mechanical switches, they use high-speed transistors to represent either an ON condition or an OFF condition. Various types of logic, representing different technologies, are available to logic designers. The choice of a particular family is determined by factors such as speed, cost, availability, noise immunity, and so forth. The key requirement within each family is compatibility; that is, there must be consistency within the logic levels and power supplies of various integrated circuits made by different manufacturers. The experiments in this lab use primarily transistor-transistor logic, or TTL. The detailed performance characteristics of TTL depend on the particular subfamily. However, all TTL is designed to operate from a 5 V power supply, and the logic levels are the same for all TTL integrated circuits.

**AND:** Logic eqn.  $Y=A.B$ . The output of AND gate is true (1) when the inputs A and B are true.

**OR:** Logic eqn.  $Y=A+B$ . The output of OR gate is true when one of the inputs A and B or both the inputs are true.

**NOT:** Logic eqn.  $Y = \bar{A}$  . The output of NOT gate is complement of the input.

**NAND:** Logic eqn.  $Y=\overline{A.B}$ . The output of NAND gate is true when one of the inputs or both the inputs are low.

**NOR:** Logical eqn.  $Y=\overline{A+B}$ . The output of NOR gate is true when both the inputs are low.

**EX-OR:** Logic eqn.  $Y=\bar{A}B+A\bar{B}$ . The output of EX-OR gate is true when both the inputs are dissimilar.

## PROCEDURE

- 1) Give biasing to the IC and do necessary connections.
- 2) Give various combinations of inputs and note down the output with help of LED for all gates one by one.
- 3) Observe the output and verify the truth tables for all gates.

## CONCLUSION

Thus all basic gates are studied.

- REVIEW QUESTIONS**
- 1) A burglar alarm for a car has a normally LOW (grounded) switch on each of four doors. If any door is opened, the output of that switch goes HIGH. The alarm is set off with an active-LOW output . What type of gate will provide this logic?
  - 2) If more than two input AND & OR gates are available, how will you connect its inputs so that they work as two input gates? Perform it for three and four input AND & OR gates.