Department of Computer Science and Engineering
BRAC University
CSE 260: Digital Logic Design

Experiment # 2: Universal Gates, Applications of Boolean Algebra

Objective:

- To investigate the rules of Boolean algebra.
- To gain experience working with practical circuits.
- To simplify a complex function using Boolean algebra.

Required Components:

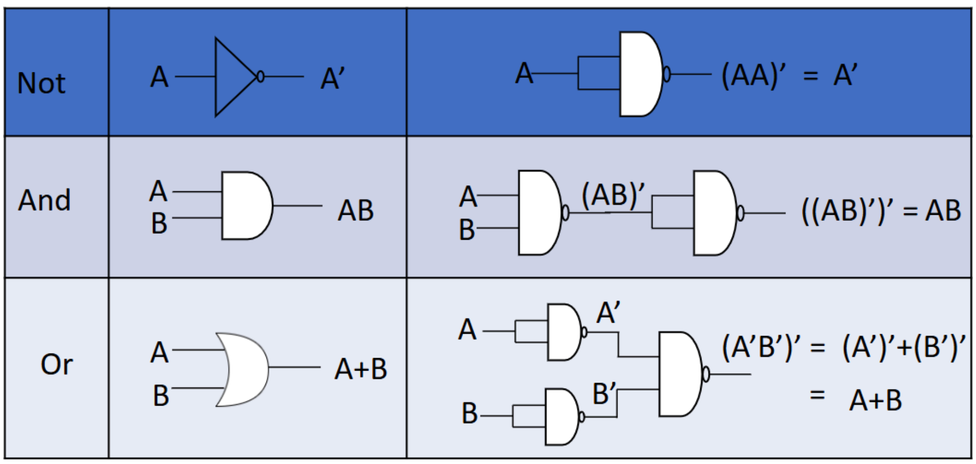
1. IC 7400 × 1
2. IC 7402 x 2

Boolean Postulates & Theorems:

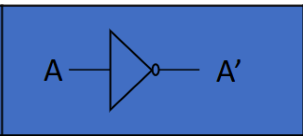
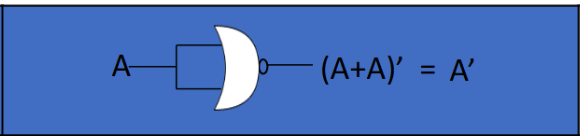
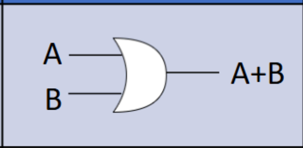
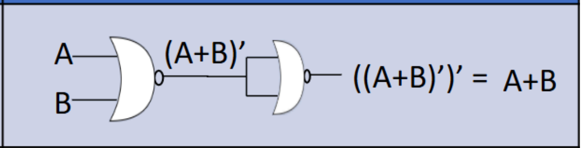
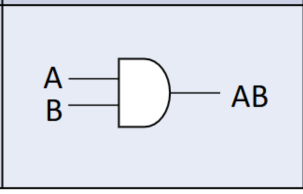
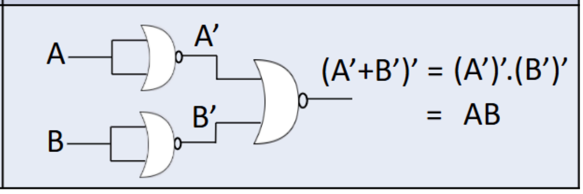
Postulate 2:	(a) x + 0 = x	(b) x . 1 = x
Postulate 3: Commutative	(a) x + y = y + x	(b) x . y = y . x
Postulate 4: Distributive	(a) x(y+z) = xy + xz	(b) x + yz = (x+y).(x+z)
Postulate 5:	(a) x + x’ = 1	(b) x . x’ = 0
Theorem 1:	(a) x + x = x	(b) x . x = x
Theorem 2:	(a) x + 1 = 1	(b) x . 0 = 0
Theorem 3: Involution	(x’)’ = x	
Theorem 4: Associative	(a) x+(y+z) = (x+y) +z	(b) x.(y.z) = (x.y).z
Theorem 5: DeMorgan	(a) (x + y)’ = x’ . y’	(b) (xy)’ = x’ + y’
Theorem 6: Absorption	(a) x + xy = x	(b) x. (x + y) = x

Diagrams:

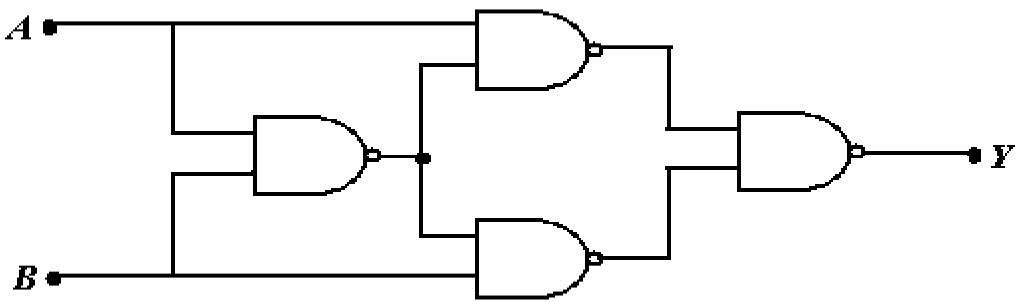
Building basic gates using Universal (NAND) Gate(s):



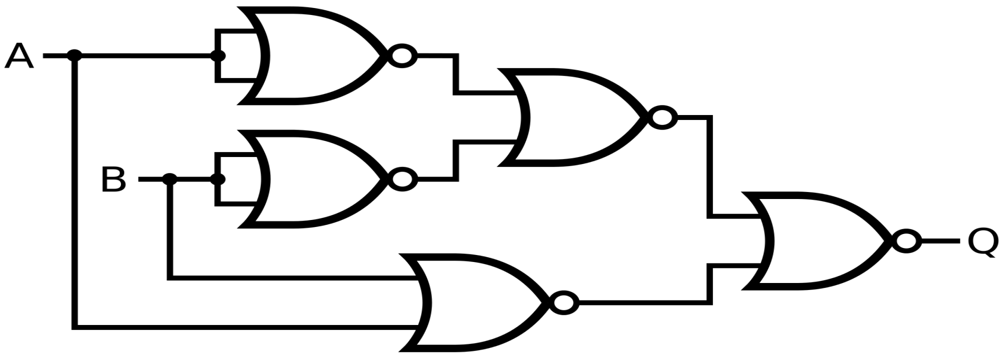
Building basic gates using Universal (NOR) Gate(s):

Not		
Or		
And		

Circuit Diagram - 1:



Circuit Diagram - 2:



Procedure:

- Construct the Circuit Diagram - 1 on the breadboard.
- Remember to connect each IC’s VCC pin to the “+5V” position of the DC Power Supply of the trainer board, and the GND or 0V pin to the “GND” position of the trainer board.
- Connect the inputs to the Data switches and outputs to any position of the LED Display.
- Find out the outputs for all possible combinations of input states.
- Write down the input-output in tabular form.