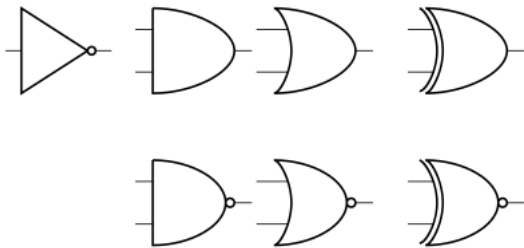


CS61c Summer 2014 Discussion 10 – Synchronous Digital Systems and Boolean Algebra

July 23, 2014

1 Logic Gates

1. Label the following logic gates:



2. Convert the following to boolean expressions:

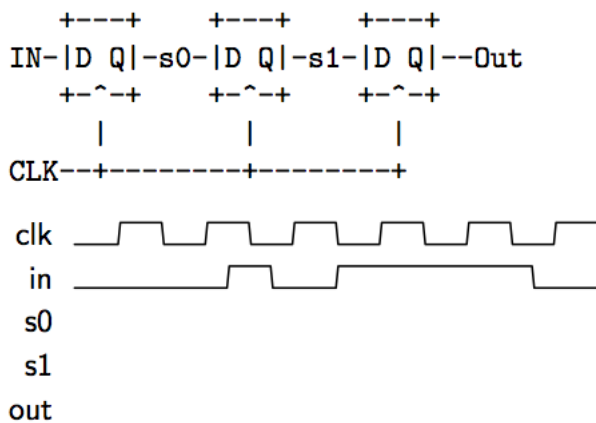
- (a) NAND
- (b) XOR
- (c) XNOR

3. Create an AND gate using only NAND gates.

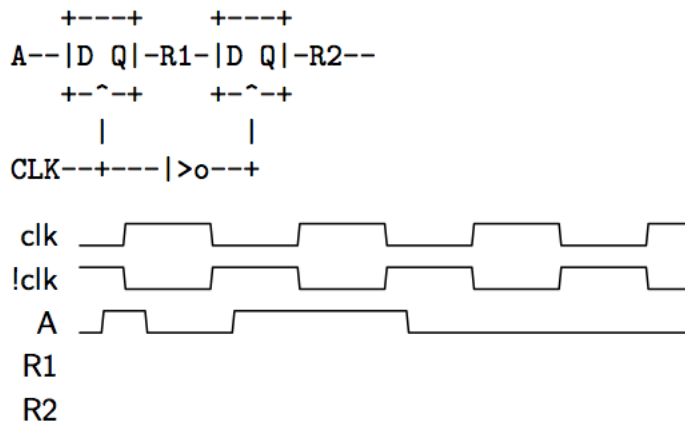
4. How many different two-input logic gates can there be? How many n-input logic gates?

2 State

1. Fill out the timing diagram for the circuit below:



2. Fill out the timing diagram for the circuit below:



3 Boolean Logic

- $A + \bar{A} = 1$
- $0B = 0$
- $(A + B)(A + C) = A + BC$
- $1 + A = 1$
- $B\bar{B} = 0$
- $\overline{AB} = \bar{A} + \bar{B}$
- $A + AB = A$
- $A + \bar{A}B = A + B$
- $\overline{A+B} = \bar{A}\bar{B}$

1. Minimize the following boolean expressions:

(a) Standard: $(A + B)(A + \bar{B})C$

(b) Grouping & Extra Terms: $\bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + ABC + A\bar{B}C$

(c) DeMorgan's: $\overline{A(\bar{B}\bar{C} + BC)}$