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Cpr E 281 LAB 09
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Lab 9 Answer Sheet

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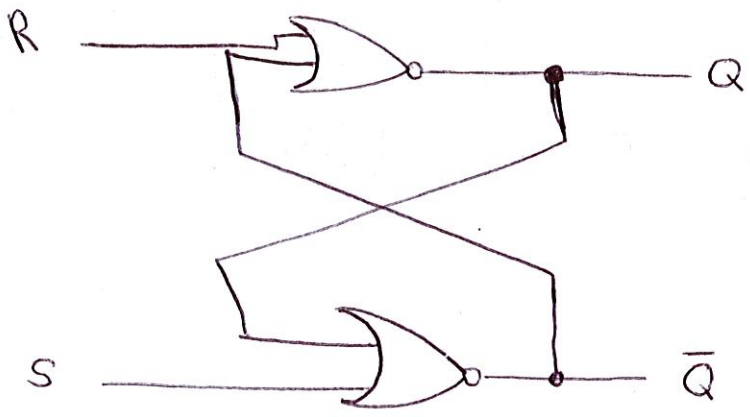
Date: November 3, 2016

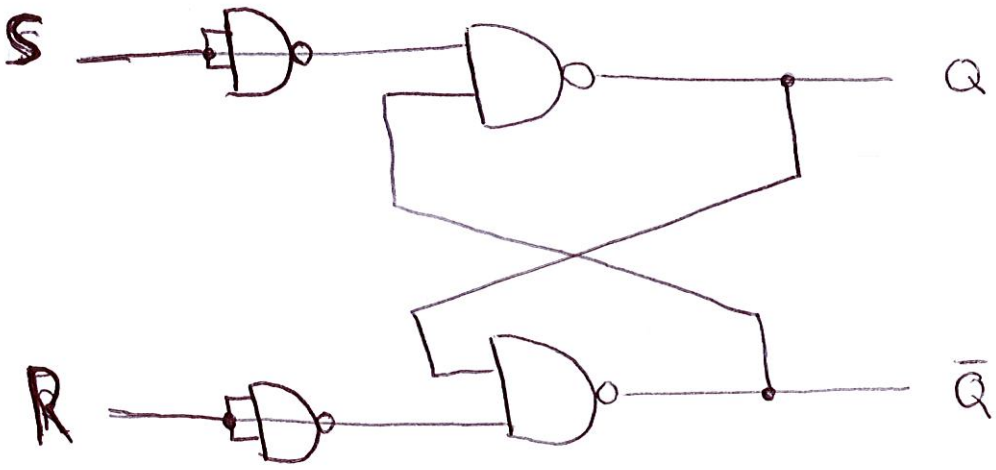
PRELAB:

Refer to Chapter 5 in your textbook and the lab instructions to complete your pre-lab. Please read all the material and complete the circuit diagrams before you come to the lab.

Q1. Draw the circuit diagram for the SR Latch using NOR Gates for **Section 2.0** in the space below.

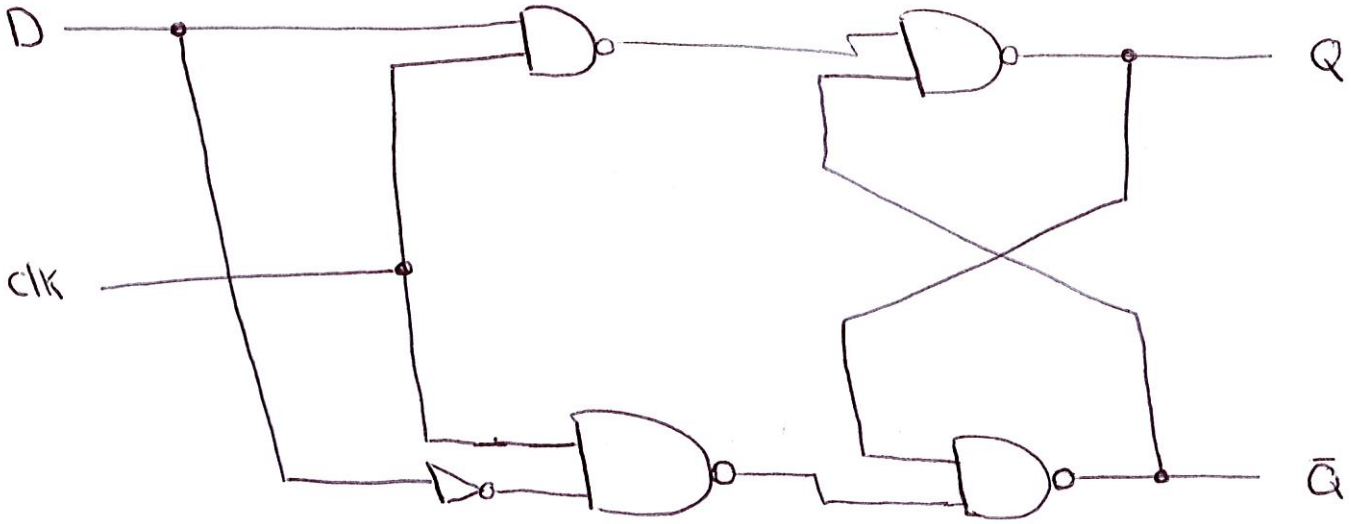


Q2. Draw the circuit diagram for the $\overline{SR}$ Latch using NAND Gates for **Section 2.0** in the space below.

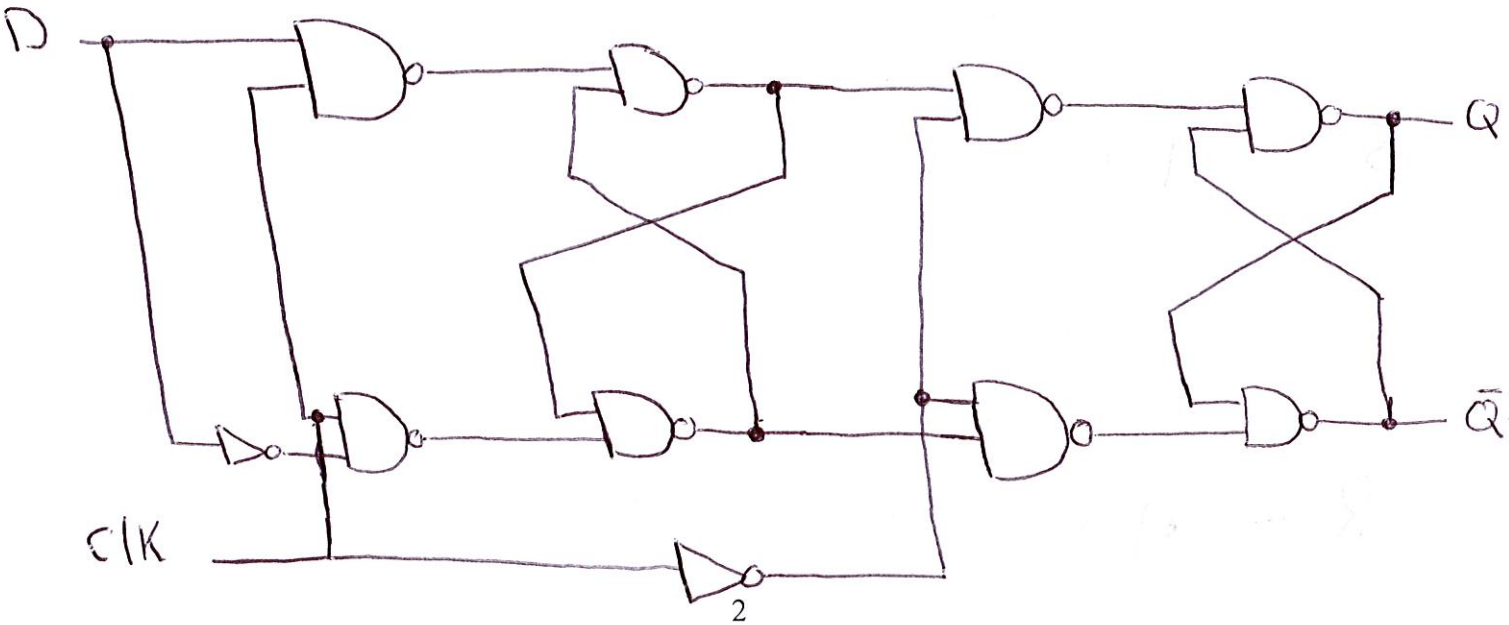


Lab 9 Answer Sheet

Q3. Draw the circuit diagram for the D Latch using NAND Gates and a NOT gate for **Section 3.0** in the space below.

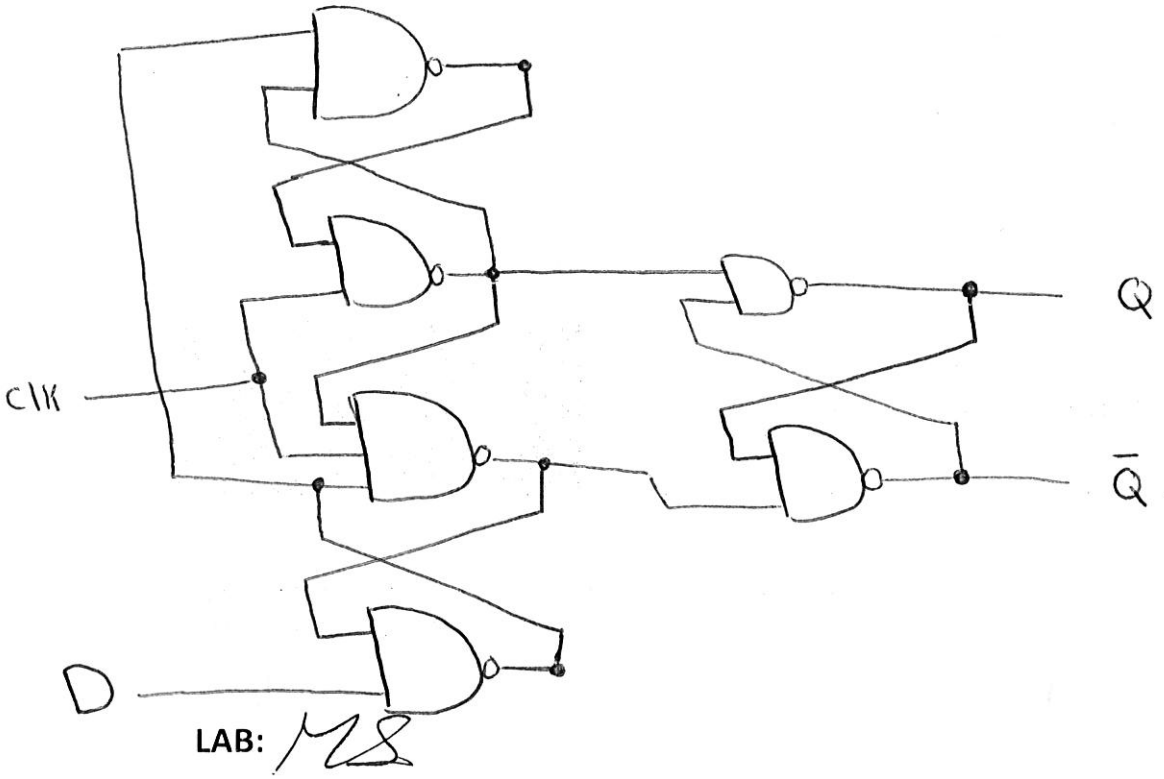


Q4. Draw the circuit diagram for the Master-Slave D Flip-Flop for **Section 4.0** using the D latches you built in the previous step in the space below. The flip-flop should be triggered by the negative edge of the clock.



Lab 9 Answer Sheet

Q5. Draw the circuit diagram for the Positive-Edge-Triggered D Flip-Flop using NAND gates for **Section 4.0** in the space below.



LAB: MS

2.0 Complete the characteristic table for both versions of the SR latch. Do both versions function properly as a latch?

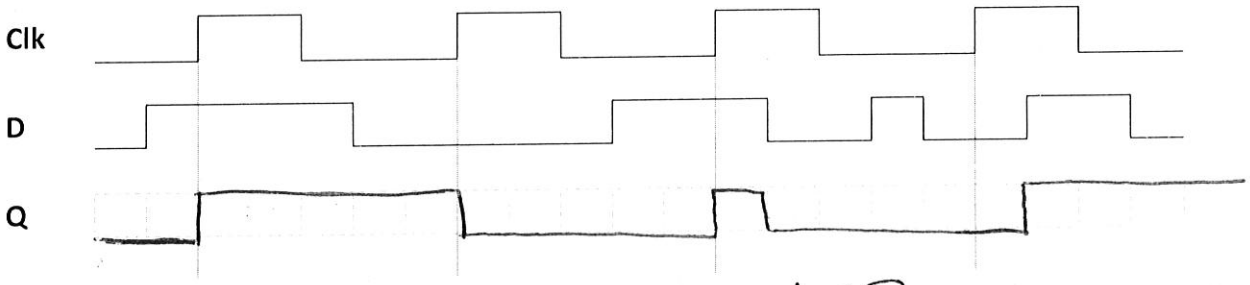
SR NOR Latch		
S	**R**	**Action**
0	0	*Keep State*
0	1	$Q = 0$
1	0	$Q = 1$
1	1	*Restricted Combination*

$\overline{SR}$ NAND Latch		
S	**R**	**Action**
0	0	Keep State
0	1	$Q = 0$
1	0	$Q = 1$
1	1	Restricted Combination

Hardware results demonstrate a good circuit. TA Initials: **NOR** MS **NAND** MS

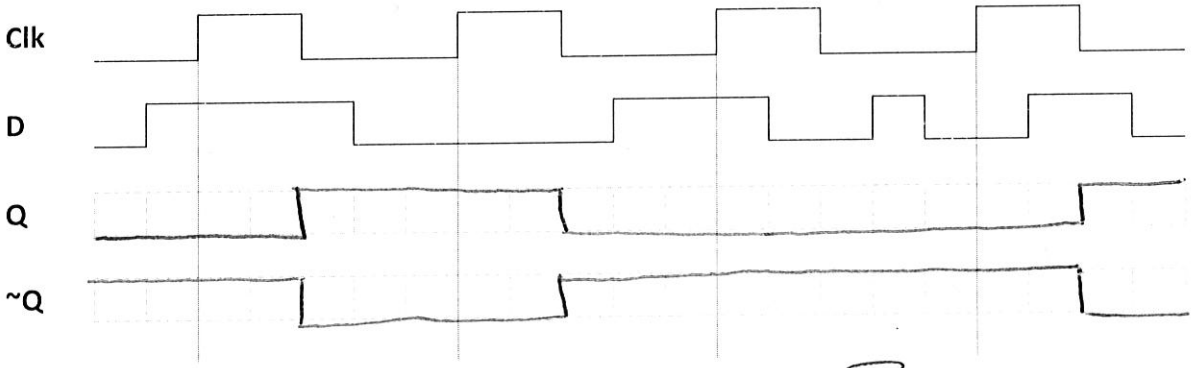
Lab 9 Answer Sheet

3.0 Complete the timing diagram below for your Gated D Latch. What is the difference between this gated latch and the previous basic latches?



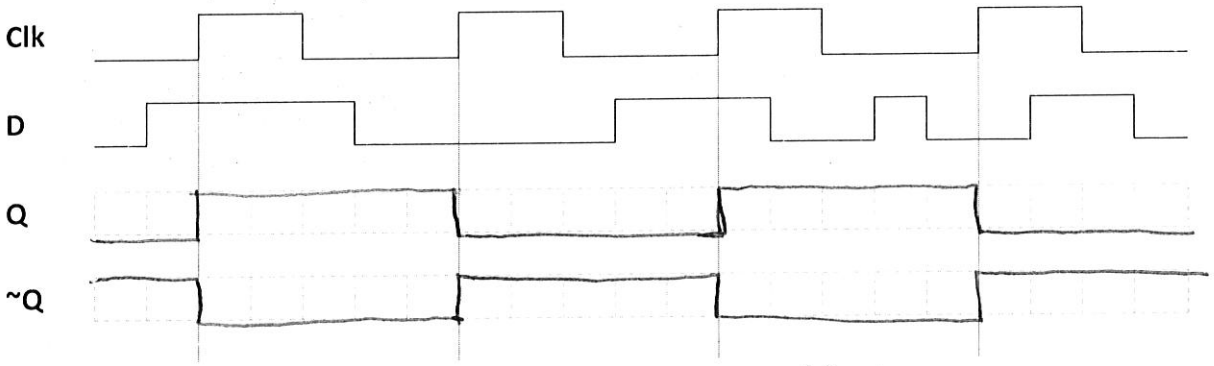
Hardware results demonstrate a good circuit. TA Initials: MS

4.0 Complete the timing diagram below for your Negative-Edge-Triggered D Flip-Flop.



Hardware results demonstrate a good circuit. TA Initials: MS

Complete the timing diagram below for your Positive-Edge-Triggered D Flip-Flop.



Hardware results demonstrate a good circuit. TA Initials: AW