Student Name: _____ Student #:_____

Experiment 2a (RS Flip-Flops)

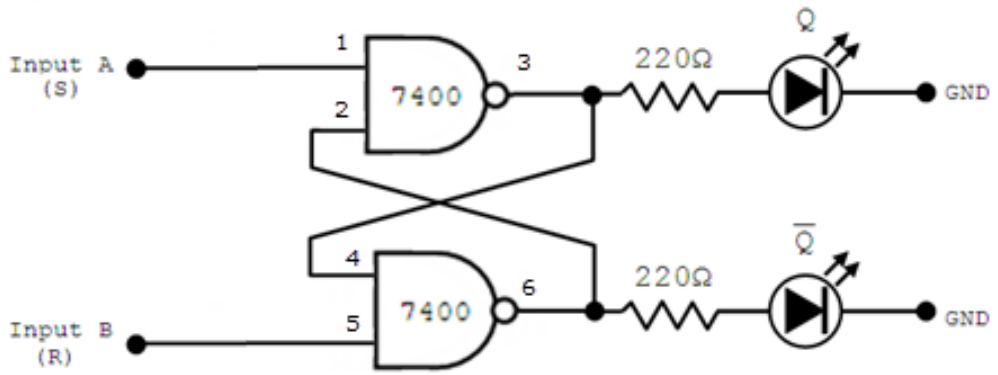
RS NAND Flip-Flop

AIM:
To investigate the operation of a RS NAND flip-flop, simple memory.

So far you have worked exclusively with combinatorial logic, i.e. circuits for which the output depends only on the current state of the inputs. In many instances it is desirable to have the *next* output of a circuit be dependent on the *current* output of the circuit. Circuits that remember their current output or state are often called sequential logic circuits. Clearly, sequential logic requires the ability to store the current state. In other words, *memory* is required by sequential logic circuits, which can be created with logic gates. If you arrange the gates correctly, they will remember an input value. This concept is the basis of RAM (random access memory) in computers, and also makes it possible to create a wide variety of other useful circuits.

MATERIALS:
1. 1 x 7400 integrated circuit (IC)
2. 4 x 220 ohm or 330 ohm resistors
3. 1 x DIP Switch (same as in the previous lab with 4 ON/OFF switches)
4. 2 x LEDs (Light Emitting Diode)

CIRCUIT:



PROCEDURE:
1. Assemble the circuit on the breadboard. The inputs will come from the DIP Switch
   Paste a picture of your circuit here:

Screenshot:

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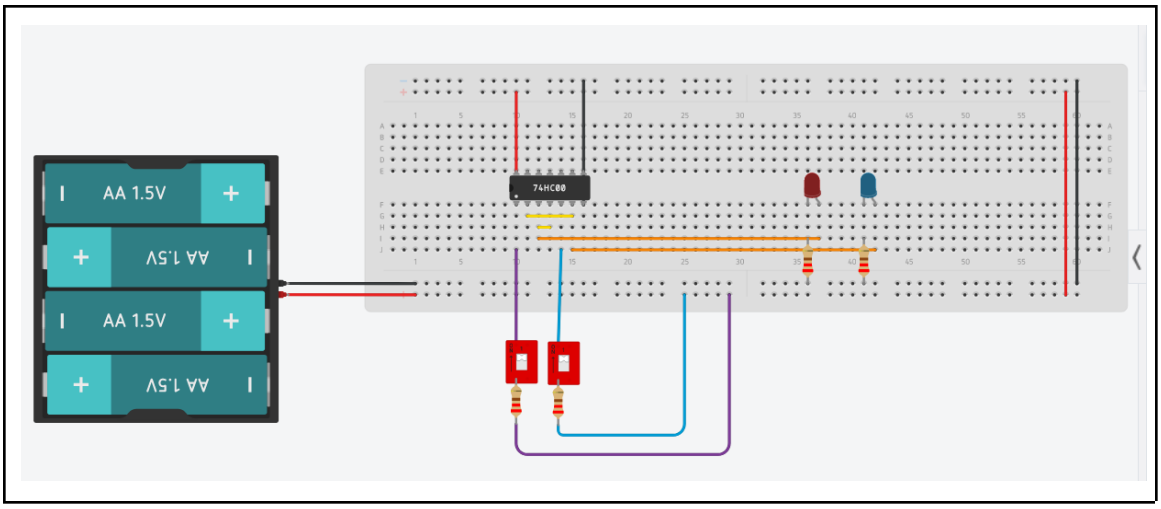

2. Toggle the inputs A and B, while observing the output for each of the input states listed in the observations chart below. Record your observations in the chart below. **Make sure that you set the input in the exact order given in the chart below (in other words toggle inputs in order as indicated in part a to b, then b to c etc).**

OBSERVATIONS:

		A	B	X	Y
Circuit Inputs and Outputs		**S**	**R**	**Q**	**Q'**
Step	**a**	0	1	1	0
	b	1	1	1	0
	c	1	0	0	1
	d	1	1	0	1
	e	0	0	1	1
	f	1	1	0	1

QUESTIONS for Part A:

1. What happens to the output when going from step a to step b of the Truth Table?

The output does not change because the previous Q and Q' values were being used as inputs.

2. What happens to the output when going from step c to step d of the Truth Table?

The output does not change because the previous Q and Q' values were being used as inputs.

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3. From your pre-lab readings, what is the name of the state of the inputs in steps b and d? Why is this an appropriate name for this state?

The name of the state of the inputs in steps b and d is “Hold”. This is an appropriate name for this state because this is the rest position where Q and Q’ remain similar to their previous complementary states..

4. The outputs for step e of the Truth Table are not complements. Why is this a problem?

This is a problem because this gives the same value for both complements which is prohibited in any RS flip-flop hence is called the prohibited state.

5. Try going from step e to step f of the Truth Table several times. Is their output consistent? Is this a problem?

Their output is not consistent because it depends on which one is turned on first. For instance if, S is turned on prior to turning on R then Q’ turns on and vice versa. This is not a problem because it fulfills the purpose of a RS flip flop which is to remember the previous outputs.

6. What inputs are needed to form the forbidden state? (forbidden state is when the two outputs are not complementary).

To form the forbidden state for an active low flip flop, the inputs 0 and 0 for both R and S are needed.

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