Lab #9   Name: _____ Per: _____

Title: R-S FLIP FLOPS

Materials:
[1]   7400 2-input NAND gate IC
[1]   clock (single pulses)

Procedure:

1.   On a separate sheet of paper, **draw** a logic diagram for the R-S flip-flop shown in Fig. 9(a). Use two 2-input NAND gates.
2.   Insert the 7400 into the breadboard.
3.   Construct the circuit you drew in step 1.
4.   Operate the input switches as shown in Table 9-1. Observe and record the results in the output columns. **Get Instructor's Signature.**
5.   **Have Instructor check your pulse clock if you're not sure that it works.**
6.   In the rightmost column of Table 9-1 write the name of the condition of the outputs. Use term "hold", "set", or "reset".
7.   On a separate sheet of paper, **draw** a logic diagram for the clocked R-S flip flop shown in Fig. 9(b). Use four 2-input NAND gates.
8.   Construct the circuit you drew in step 6.
9.   Operate the input switches as shown in Table 9-2 and record the output results. **Get Instructor's Signature.**

Questions: (answer on a separate piece of paper – **"Draw"** means you must use a template)**:**

1.   Describe the input conditions on the *R-S flip-flop* for the set, reset, and hold conditions. Label the inputs R & S and the outputs Q and $\overline{Q}$.
2.   Describe the input conditions on the *clocked R-S flip-flop* for the set, reset, and hold conditions. Label the inputs R & S and the outputs Q and $\overline{Q}$.
3.   Describe the input conditions on the *R-S flip-flop* that are considered the prohibited state/condition.
4.   Describe the input conditions on the *clocked R-S flip-flop* that are considered the prohibited state/condition.
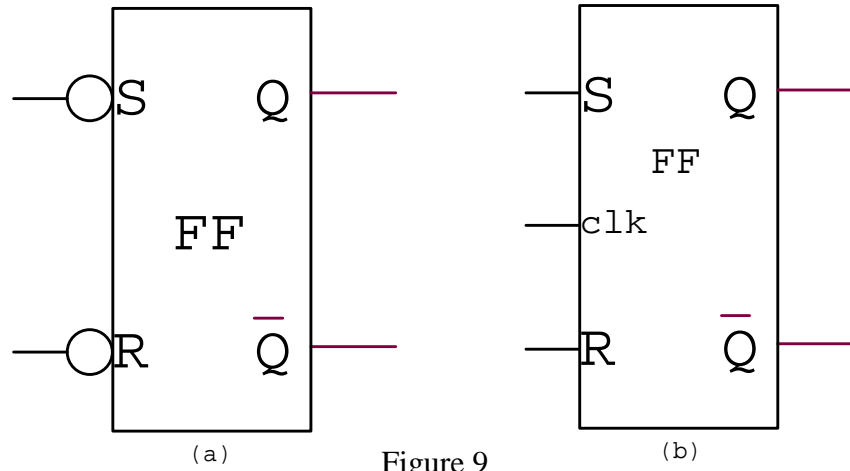
(a)   Figure 9   (b)

Inputs		Outputs		
S	R	Q	$\bar{Q}$	Name of Condition
0	0			Prohibited
0	1			
1	0			
1	1			
				hold, set, or reset

Table 9-1 R-S Flip-Flop

Inputs			Outputs				
Clock	Data		Before clock pulse		After clock pulse		Name of Condition
Clk	S	R	Q	$\bar{Q}$	Q	$\bar{Q}$	
↑	0	0	0	1			
↑	0	1	0	1			
↑	1	0	0	1			
↑	1	1	0	1			Prohibited
↑	0	0	1	0			
↑	0	1	1	0			
↑	1	0	1	0			
↑	1	1	1	0			Prohibited
							hold, reset, or set

Table 9-2 Clocked R-S Flip-Flop