CPSC 2500
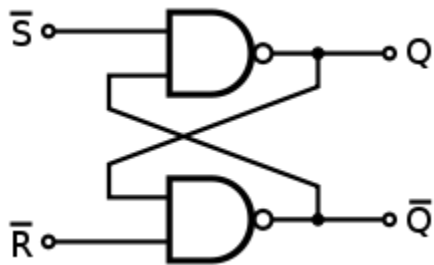
Computer Organization

Homework 3 (100 points)

Due: Oct 30, 9:20 AM (in class)

NOTE: Please write/print your answers to the following questions and submit it in class on Oct 30 (Friday). Please DO NOT submit on Canvas or via email. This assignment is to be done individually; you can discuss the questions with your classmates, but you should write your answers independently.
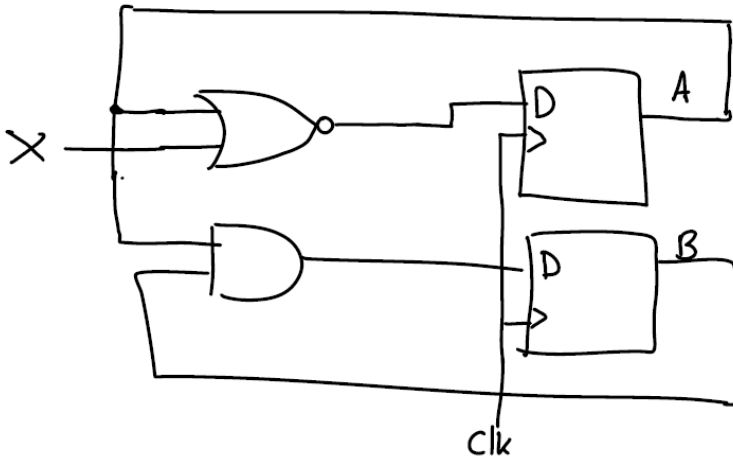
1A. For the circuit shown below, complete the truth table. (10)

!S	!R	Q_{curr}	Q_{new}
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

1B. How does the operation of the circuit in 1A compare to the operation of SR latch we discussed in class? (10)

2. Complete the truth table for the following sequential circuit. (10)

Current State		Input	Next State	
A	**B**	**X**	**A**	**B**
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

3. Using logic gates, draw a circuit diagram for comparing two 32-bit numbers. The circuit should return 1 if the numbers match, else return 0. Use the shorthand notation for multiple-bit line when drawing the circuit. (10)

4. Memory Organization

A. For a byte-addressable memory, how many address bits are needed for 256 MB? (10)

B. For a byte-addressable memory, how much memory can be accessed using a 34 bit address? Express your answer using metric prefixes. (10)

C. For a word-addressable memory where each word is 64 bits, how much memory can be accessed using a 34 bit address? Express your answer using metric prefixes. (10)

D. For a word-addressable memory where each word is 64 bits, how many address bits are needed for 256 MB? (10)

5. Multiplexers

In this question, we are going to use the 8 input multiplexer shown in figure below to implement an even parity function, i.e., the output of the function is 1 if and only if an even number of inputs are 1. Assume that you have three input variables: A, B, C. (Note: zero is an even number.)

  A. Create a truth table for the three variable even parity function. (10)
  B. **Using the following 8-input multiplexer**, implement the Boolean function for which you created the truth table in part A. (10)