**CS 4141**
**Pre-Lab 4: Sequential Logic**

Student: Thomas Kahng
Section: 106
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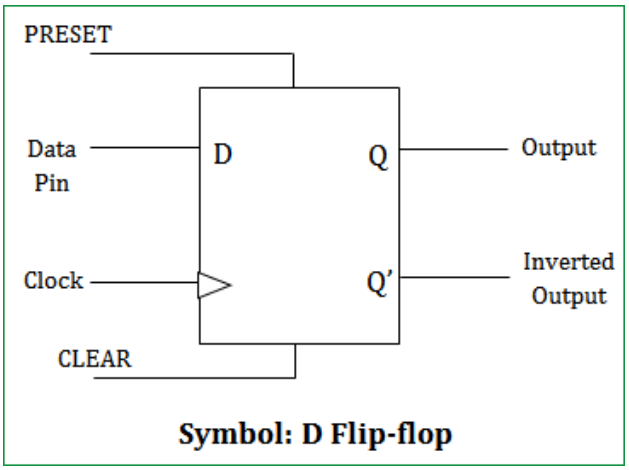
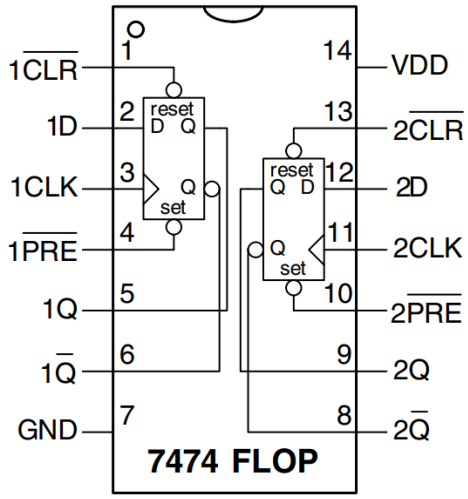
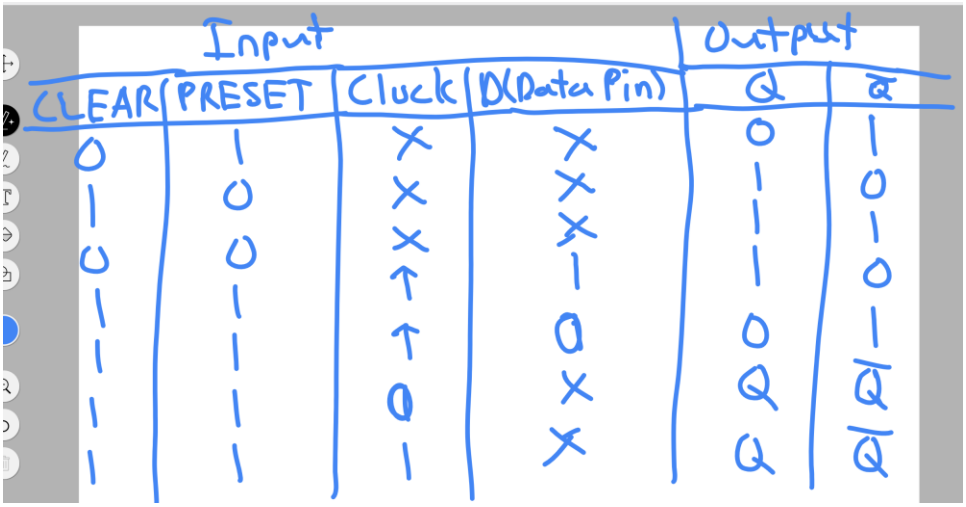
**Question 1: DFF**
Below are the DFF logic symbol and circuit diagram (from ic_diagrams.pdf).

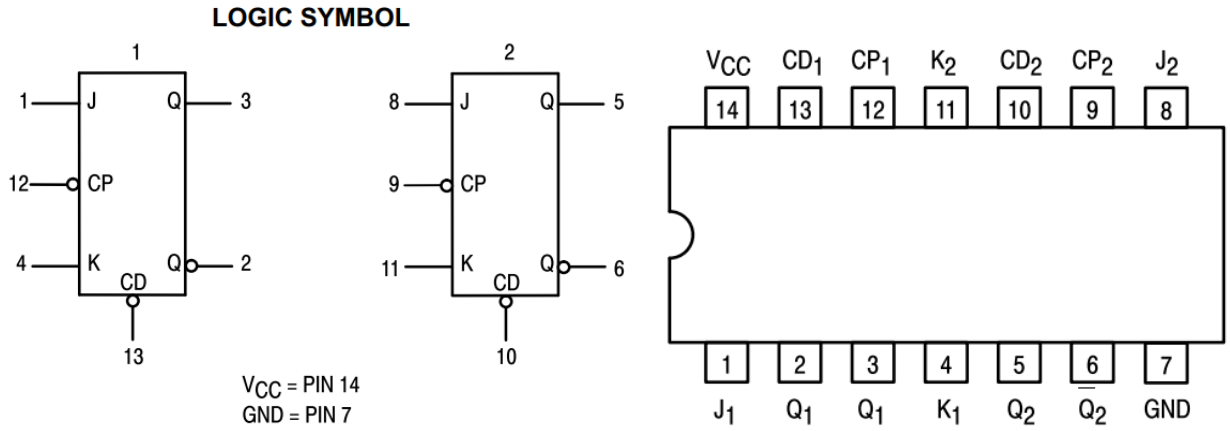



Learn about D Flip-Flop IC 7474. Draw truth table for the output Q and Q'. Consider all inputs including PRESET and CLEAR.



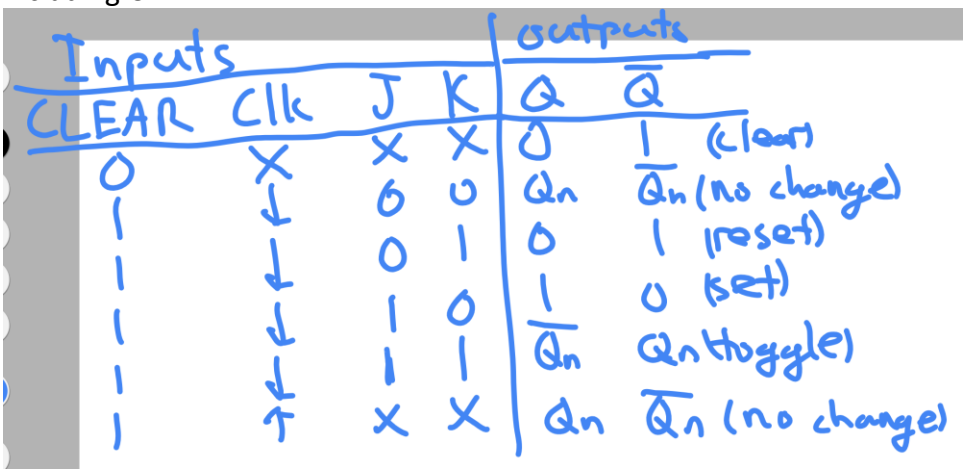

**Question 2: JK-FF**
Below are the logic symbol and IC diagram of the JK-FF.




Notes:

- CD stands for Clear, CP stands for Clock.
- **Pin 2 of the chip is Q1_bar, and pin 3 is Q1**.

Learn about JK Flip-Flop IC 74107. Draw truth table for the output Q and Q'. Consider all inputs including CLEAR.




**Question 3: Building ALU based 4-bit addition using two 74SL74 (4 D FF's) and a 4-bit adder.**

Provide an implementation to perform the following ALU addition operation.

Add A,B – This operation adds A and B and stores the result in A.

Create a 4-bit register using 4 D FFs and it acts as an accumulator. This accumulator is connected with an adder and is performing the following task.

The initial value of the accumulator is 0 and every time a clock pulse is given, it adds the current value of the accumulator (let's call it A) and a given 4-bit input B. The B input is provided using 4 input switches. Thus, the accumulator stores the addition of multiple 4-bit values provided to the ALU.

• Draw the circuit/logic diagram.