

# CIS 351 Sample SL2 Problem Solutions

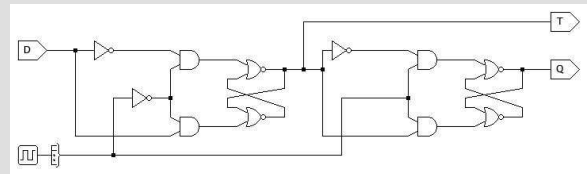
Thu 6<sup>th</sup> Jan, 2022

## SL2: Flip-Flops

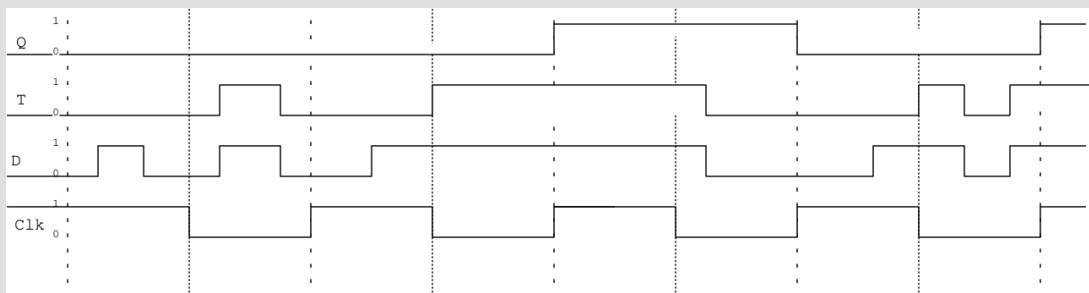
Consider the master-slave flip-flop shown to the right:

- (a) Is this a rising-edge, or falling-edge flip-flop? How can you tell?

It is a *rising-edge* triggered flip-flop. You can tell because the latch attached to the output  $Q$  changes values when the clock rises from 0 to 1. (From the perspective of the user,  $Q$  contains the current state of the flip-flop.)



- (b) Explain what gives this circuit its “instant trigger point.”
- (c) Complete the timing diagram below that shows the *internal* operation of the master-slave flip-flop.



- (d) Complete the timing diagram below that shows the *external* behavior of the master-slave flip-flop. (This is similar to problems 6-8 on the Sequential Circuit lab.)

