INTERVIEW QUESTION

Question 3.3: What is the difference between a latch and a flip-flop? Under what circumstances is each one preferable?

A latch allows data to flow through when its CLK rises, which updates the output to the current input. When its CLK is low, it blocks the incoming data and thus let the output retain its previous value.

A flip-flop consists of two latches connect to each other via a node. One of the latches connects to CLK, and the other one connects to $\overline{CLK}$. The flip-flop differs from the latch in that it guarantees to update the output after a low-high cycle of the clock. When the CLK rises, the flip-flop allows the incoming data to flow to the intermediate node (the output remains unchanged). When the CLK is low, the flip-flop blocks the incoming data but allows the data to flow from the intermediate node to the output which effectively change the output to the value of the input when the CLK previously rises.

In short, latch is level-triggered (output changes as soon as the input changes) and flip-flop is edge-triggered (output changes when CLK goes from high to low or from low to high).

It is generally recommended to use flip-flops rather than latches because of the edge-triggered nature of the flip-flops. However, latches can be used for simple circuits (as flip-flops double the number of latches).