

Lecture 11, Oct 3, 2022

Procedure for a Minimum Cost Cover

1. Find prime implicants
2. Identify prime implicants and include in the cover
3. Choose other PIs as needed until we cover all the 1s:
 - Do this using the largest power of two size grouping of only 1s
 - Use fewest circles to cover all the 1s
 - 1s can be circled multiple times if this allows fewer/larger circles to be used
 - Remember circles can wrap around the edges!
 - Note instead of circling 1s (minterms) for a SOP expression, we can also circle 0s (maxterms) for a POS expression

Don't Cares

- Sometimes we know specific inputs won't occur, or we don't care about what happens on an input combination
 - e.g. for a 7-segment display decoder if we only want to go from 0 to 9, we don't care when input is 1010 or higher
- Each don't care (d) term can independently be 0 or 1
- In a K-Map we put a d ; we can either include it or exclude it, depending on which lets us use fewer/larger circles

Sequential Circuits

- As opposed to combinational circuits (outputs only determined by present inputs), sequential circuits' outputs depend on previous inputs/states as well
- The simplest way to do storage is with 2 inverters in sequence, with the final output feeding back into the input
 - Once the input is high, the 2 inverters store that high input and feed it back through, so that the output stays high
 - However this is missing a way to reset the storage state

RS Latch

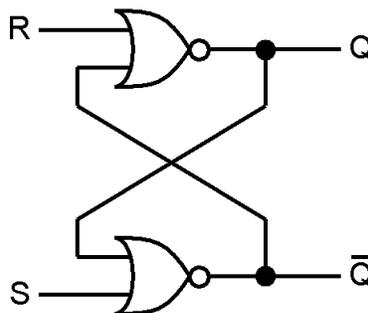


Figure 1: NOR gate RS latch

- Another way is to use 2 NOR gates
 - (Assume $S = 0$ at the start)
 - Reset Q to 0 by setting $R = 1$
 - * When $R = 1$ it doesn't matter what the lower input to the NOR gate is, the output will always be a 0

- * Setting $R = 0$ again changes nothing, since the bottom NOR gate's output 1 drives the top NOR gate to output 0
- Set S to 1, then the bottom NOR gate will always output 0, which makes Q a 1 (assuming $R = 0$)
- Set S to 0 doesn't change Q , since the previous Q of 1 is still driving the output of the bottom NOR gate to 0
- R stands for reset, S stands for set
- This is built with what's known as *cross-coupled NOR gates*