Review Problem 26

An ambulance company wants a flashing yellow light that, when a button is held, will instead hold a solid red. Design this machine.
A clock pulse is CW and is not used. For T clock cycle, D flip-flop input is held.

Period around clock edge.

Flip-flops require their inputs to be stable for time.
Can get violated by paths that are too short.

Hold: Time D must be stable after clock edge.

Olsen adds to critical path delay.

Click: Time from clock edge to 0 changing.

Olsen adds to critical path delay.

Setup: Time D must be stable before clock edge.
then randomly goes to 0 or 1
stays there for ~1-2ns
after Clk→0 the 0 output goes to 1/2

Behavior sketch:

to strange middle value:
Metastability: Input transition within T_{setup} hold period causes DFF

External inputs aren't synchronized to the clock

Table: Realities 3: External Inputs
2 DFFs in Parallel

2 DFFs in Series

Single DFF

Dealing with Metastability