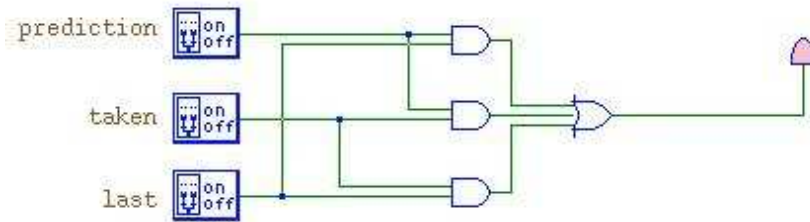


3 Sequential Circuits³ [5 marks]

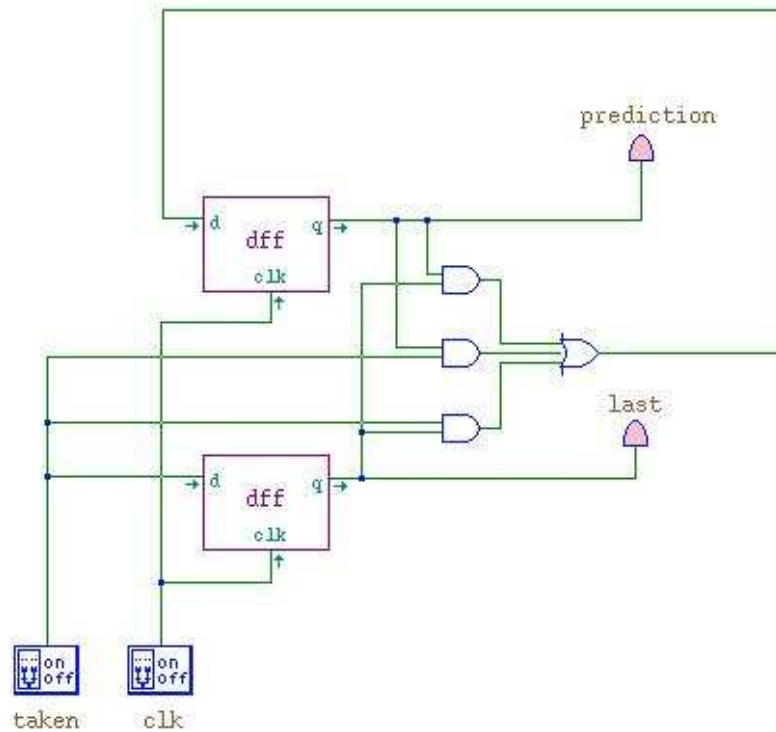
1. Fill in the following truth table for the combinational circuit shown. (Note that this is the key combinational component of the sequential circuit below.)



<i>prediction</i>	<i>taken</i>	<i>last</i>	<i>output</i>
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

³The sequential circuits question on the quiz will have exactly the same structure as this question although a different circuit, truth table, and list of inputs.

2. The table below shows the sequence of input values (i.e., values of *taken*) to the following sequential circuit each time the clock ticks (goes from low to high). Fill in the appropriate value for *prediction* and *last* immediately **after** the clock ticks for each row. Use 1 for high/true, 0 for low/false, and *U* for undefined (yellow in TkGate).⁴



<i>taken</i>	<i>prediction</i>	<i>last</i>
0		
0		
0		
1		
0		
1		
1		
0		
1		
1		
0		
0		

⁴This circuit implements a DFA used to perform branch prediction in computers; essentially, this means predicting whether the then or else branch of a conditional is taken.