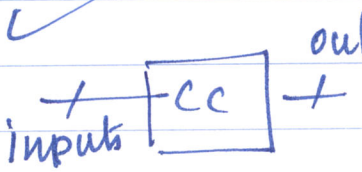
March 29, 2017

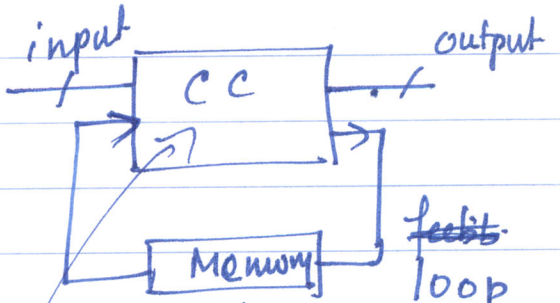
Digital Circuits

Combinatorial Circuits



"gate"

Sequential Circuits



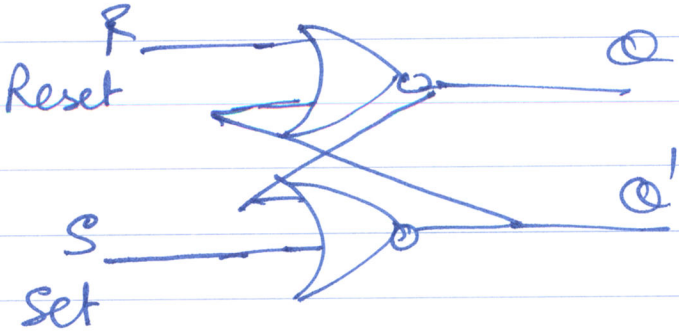
store
save
persistent

"Gates"
Computation

"Latch"

"Flip-flops"
FF

1-bit memory element



Q "state"

Q' complement of the "state"

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Different types of FF:

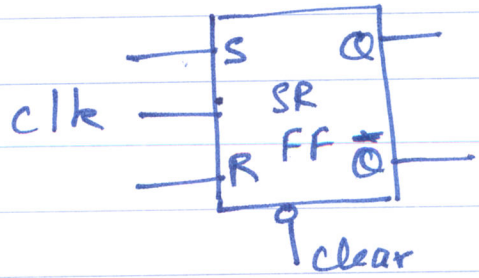
1. SR - FF set reset FF
2. JK - FF
3. T - FF
4. D - FF

SR - FF

→ Characteristic Table

S	R	Q	Q'	
0	0	0	1	no change
0	0	1	0	
1	0	1	0	set store a 1
0	1	0	1	reset set to 0
1	1	undefined		ambiguous

set? reset?



Synchronous sequential circuits

time element temporal

How do you realize time?
implement time?

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JK-FF addresses the set=1, Reset=1 Condition.

Set J	Reset K	Q	Q'	
0	0	0	1	no change
0	0	1	0	
0	1	0	1	reset
1	0	1	0	set
1	1	flip the previous state		

J	K	current Q(t)	next Q(t+1)	
0	0	0	0	no change
0	0	1	1	
0	1	0	0	
0	1	1	0	
1	0	0	1	
1	0	1	1	
1	1	0	1	
1	1	1	0	

~~1~~

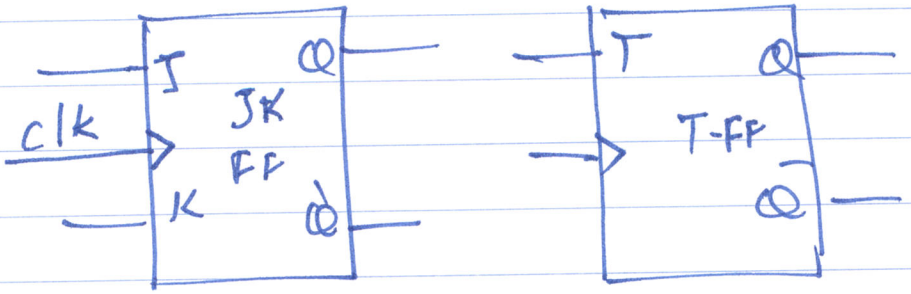
J	K	Q(t+1)
0	0	Q(t)
0	1	0
1	0	1
1	1	Q'(t)

set or reset March 29, 2017

Can we simplify these FF's?

T-oggle FF T-FF

T	Q(t+1)
0	Q(t)
1	Q'(t)



Data-FF D-FF

D	Q(t+1)
0	0
1	1