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CSCI 3130

Homework 6

Due: Feb. 28, 10:00 PM

1. (2 points) What are the fundamental differences between combinational circuits and sequential circuits?

Combinational Circ

input ⇒ output

ie: feed forward

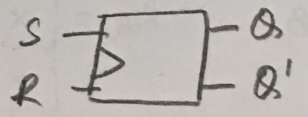
Seq. Circ

input + current output ⇒ next output

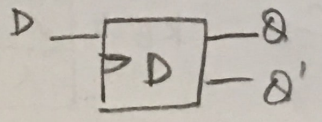
ie: feed back

2. (3 points) Draw the **blackbox** diagrams for the *three* flip-flops studied in class (SR, D, and JK).

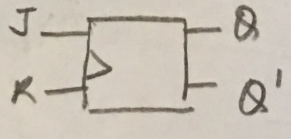
SR flip flop



D flip flop



JK flip flop



3. (2 points) Positive-edge D and JK flip-flops only update their internal state when the clock goes from 0 (low-voltage) to 1 (high-voltage) True or False?

True

4. **(8 points) Sequential Circuit** – Design a unsigned 2-bit counter using J-K flip-flops that increments by one on each clock cycle 0,1,2,3,0,1,2,3,0,... unless an external input R is turned on, which will reset the counter to 0 instead. You need to <u>show the truth table</u> for the circuit and find a simplified expression for each output <u>using a K-map</u>. Show **ALL** of your work and **draw the final circuit**.

C	A	B	A	B	JA	KA	JB	KB
0	0	0	0	0	0	X	0	X
0	0	1	0	1	0	X	X	0
0	1	0	1	0	X	0	0	X
0	1	1	1	1	X	0	X	0
1	0	0	0	1	0	X	1	X
1	0	1	1	0	1	X	X	1
1	1	0	1	1	X	0	1	X
1	1	1	0	0	X	1	X	1

JA =

	0	0	X	X
C	0	1	X	X

= CB

KA =

X	X	0	0
X	X	1	0

= JA

JB =

0	X	X	0
1	X	X	1

= C

KB =

X	0	0	X
X	1	1	X

= JB