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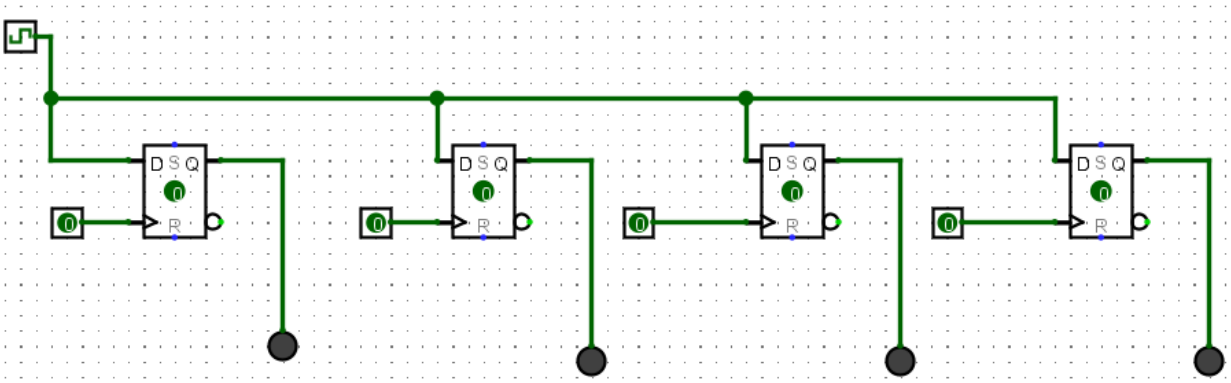
Lab 3

Register

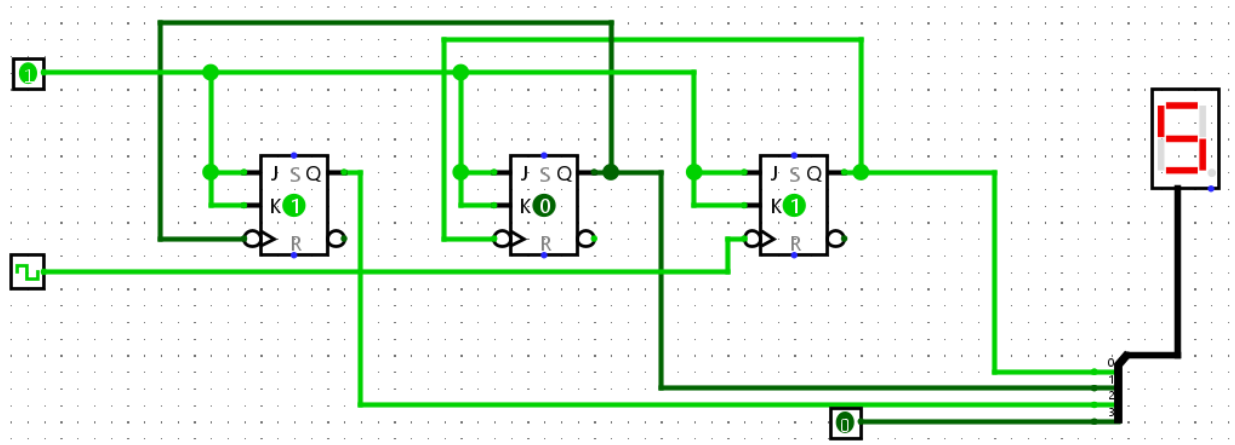


Ox	Input Binary	Output Binary
0	**0000**	0000
1	0001	0001
2	0010	0010
3	0011	0011
5	0101	0101
A	1010	1010
B	1011	1011
C	1100	1100
D	1101	1101
E	1110	1110
F	1111	1111

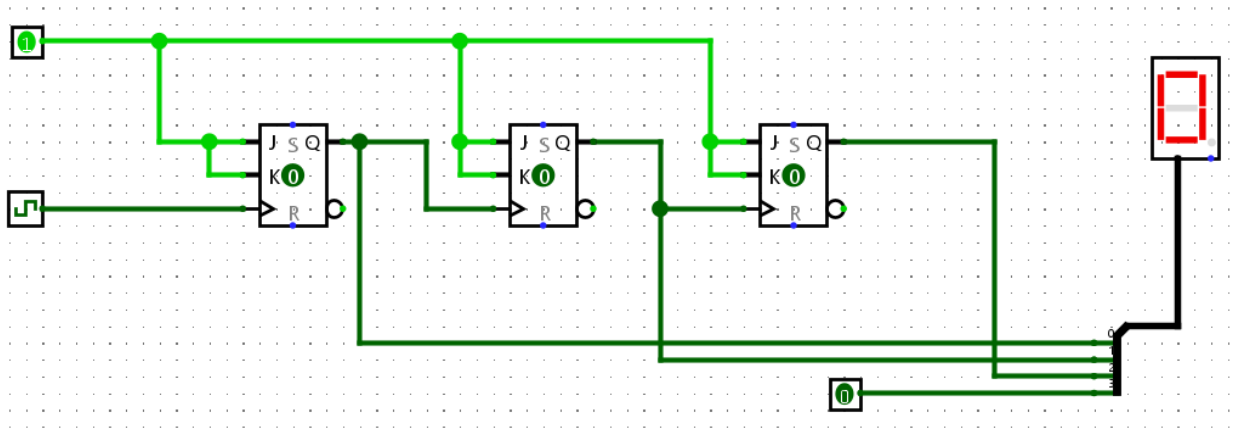
7.1. Name one crucial role (hardware) counters play in modern computing architectures?
Counters contain the address (location) of the instruction being executed at the current time. As each instruction is fetched, the program counter increases its stored value by 1. After each instruction is fetched, the program counter points to the next instruction in the sequence. When the computer restarts or is reset, the program counter normally reverts to 0.

7.2. Describe in a few sentences how a ripple counter works. How does the “ripple” occur?
Ripple counter is a special type of Asynchronous counter in which the clock pulse ripples through the circuit. The n-MOD ripple counter forms by combining an n number of flip-flops. The n-MOD ripple counter can count 2n states, and then the counter resets to its initial value.

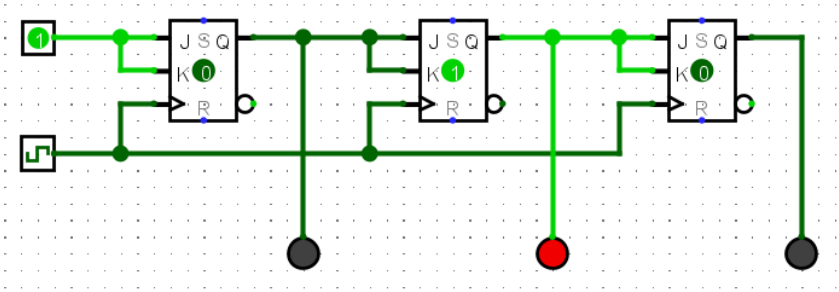
Big-endian 3-bit ripple counter



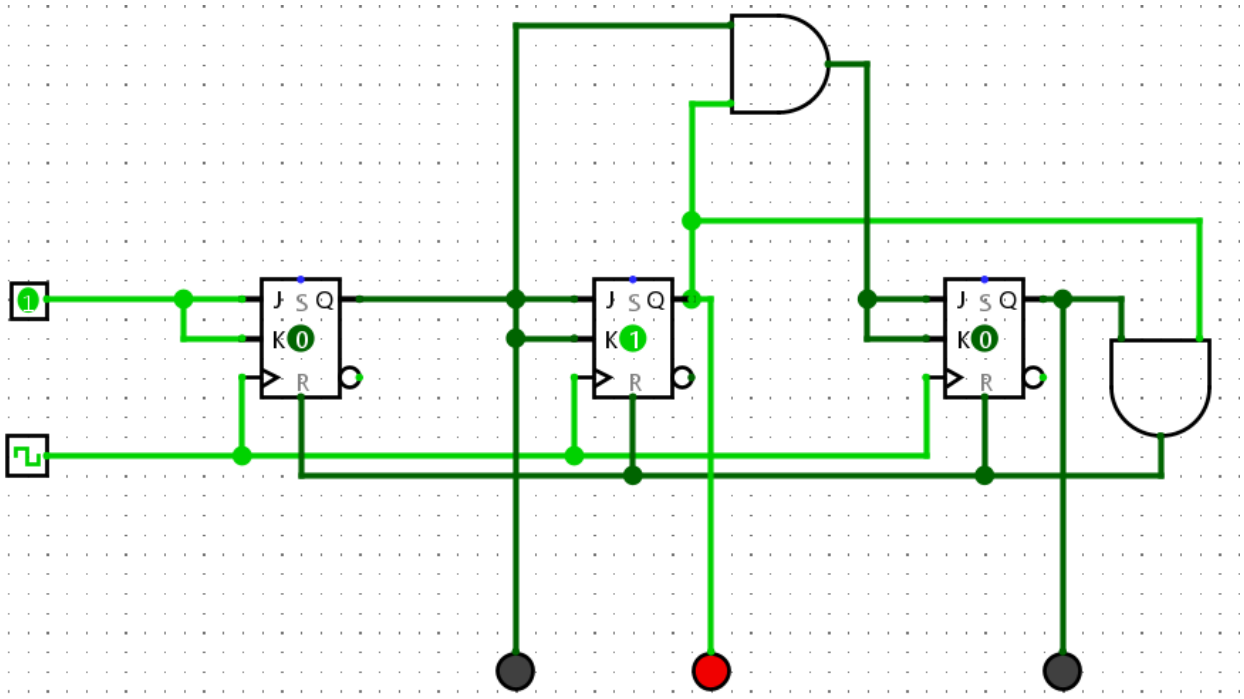
Big-endian 3-bit “count down” counter



Common clock



MOD 6



17.2. Handling the illegal state is important because this state can cause problems or even break our circuit. Removing the illegal state will allow the system to run without facing any obstacles.

MOD 6 using HEX Digit Display