Circuit Simulation Project

https://esim.fossee.in/circuit-simulation-project

Name of the Participant: Abhinav Tripathi
Title of the circuit: Design of A Self-Starting (lock-Out Free) 4-Bit Johnson Counter

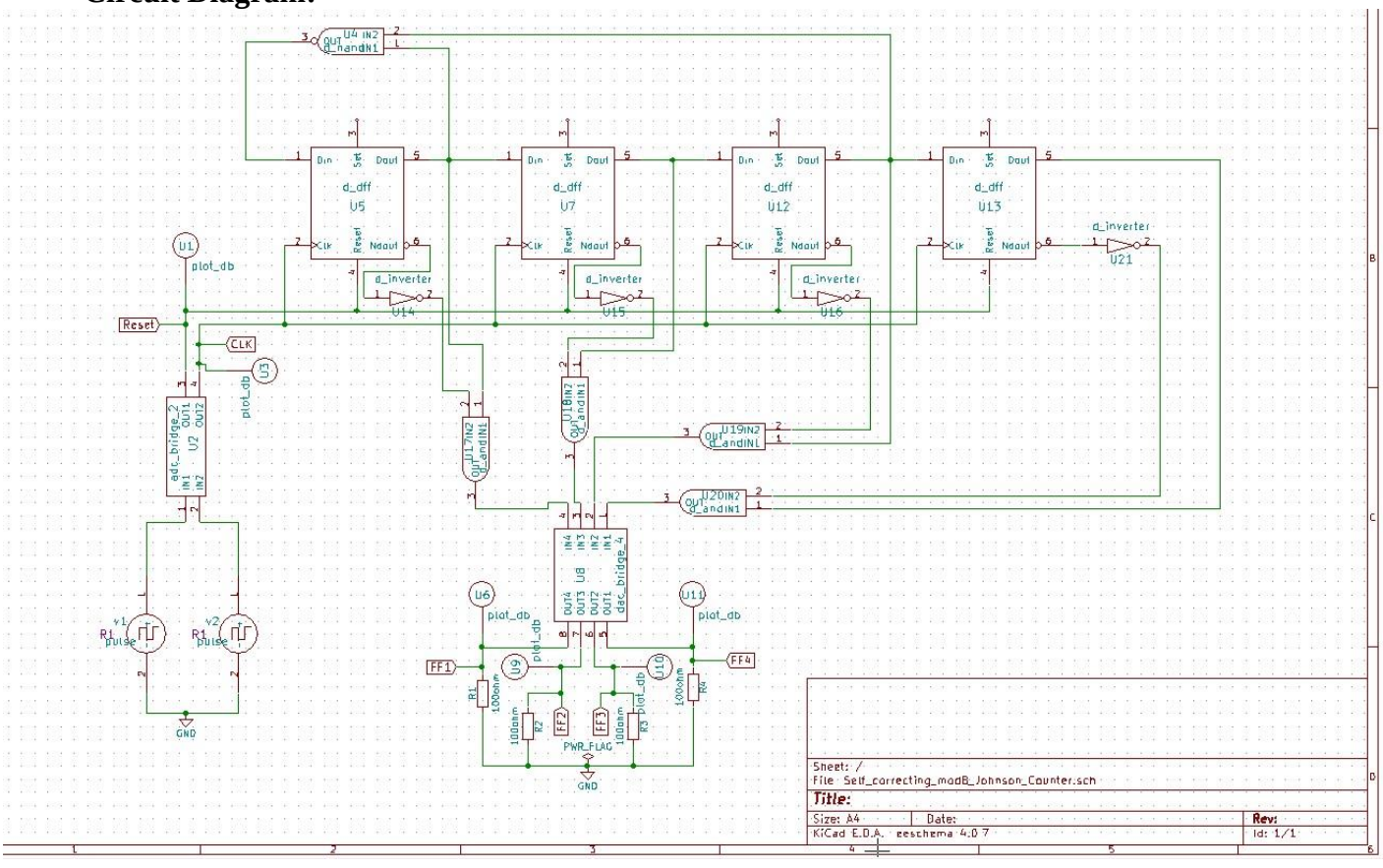
Theory:

A Johnson counter, also known as a twisted ring counter or walking ring counter, is a shift register in which the complement of the output of the last register is given as the input of the first register and circulates a stream of ones followed by zeros around the ring. There is always a problem of lock-out in counters. We design Self-starting(self-correcting) Johnson Counters to overcome the lock-out problem. Some additional combinational circuitry is used to make the counters self-starting.

For example, after every clock cycle, the parallel output of the counter is as follows:0000, 1000, 1100, 1110, 1111, 0111, 0011, 0001, 0000. But, for SELF-CORRECTING Johnson Counter output is different.

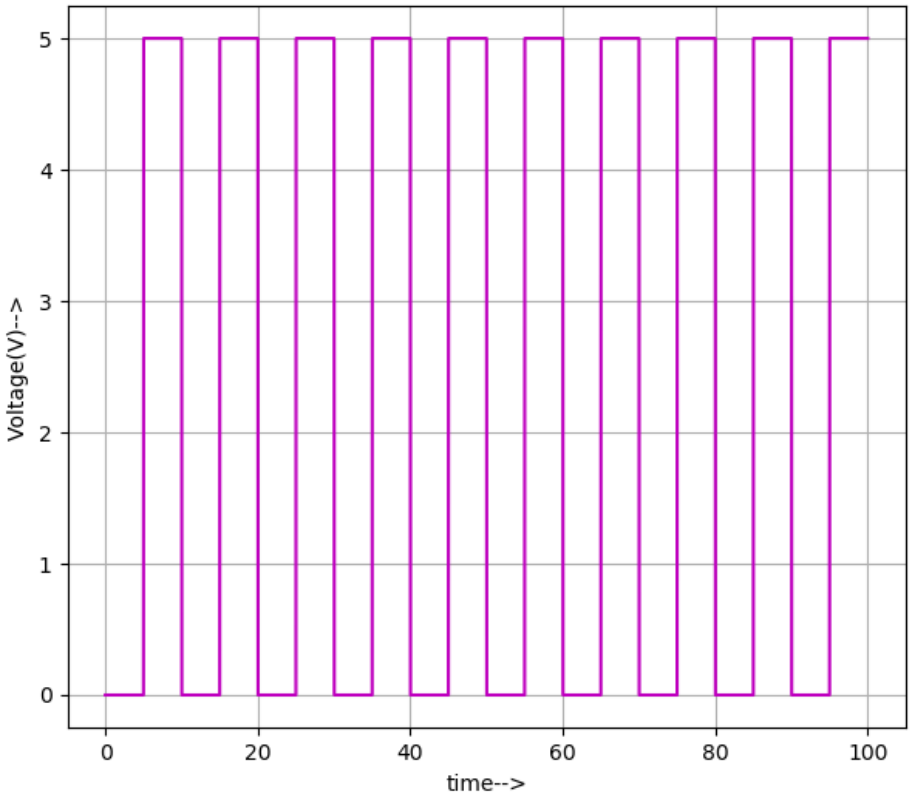
In this project, I have implemented a 4-bit self-correcting Johnson counter using 4 D flip-flops. The circuit is quite simple. There can be many ways to design a self-correcting Johnson Counter, here we have taken the Q2.Q0 to D0 and hence we prevent the lockout at the given state.

Circuit Diagram:

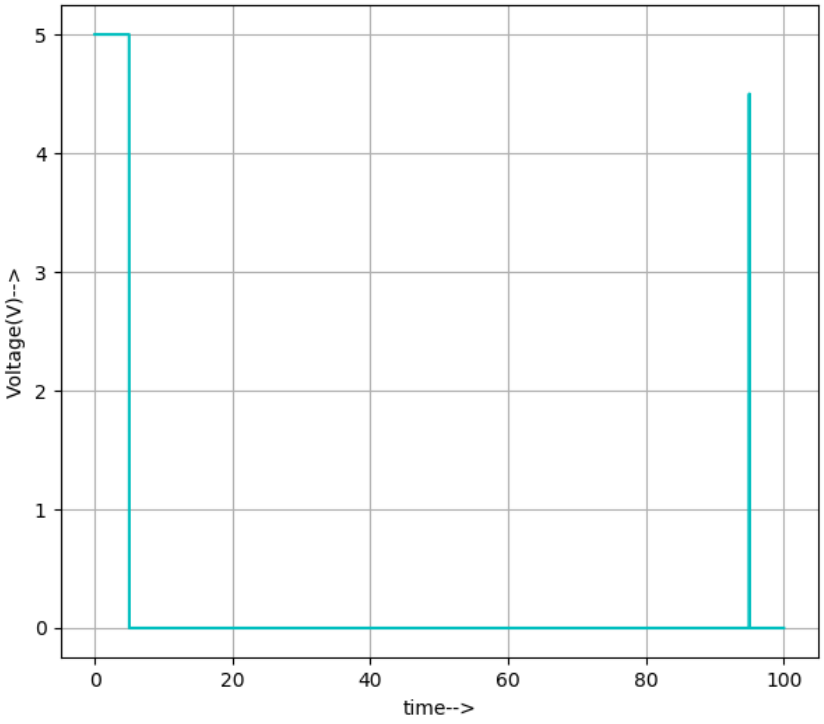


Results:

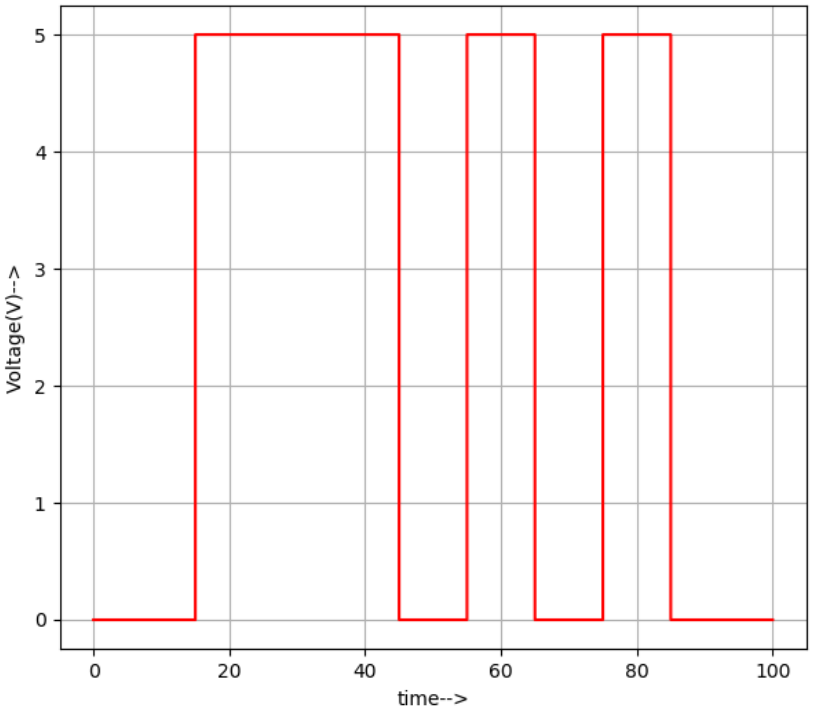
Fig 1: Source Details



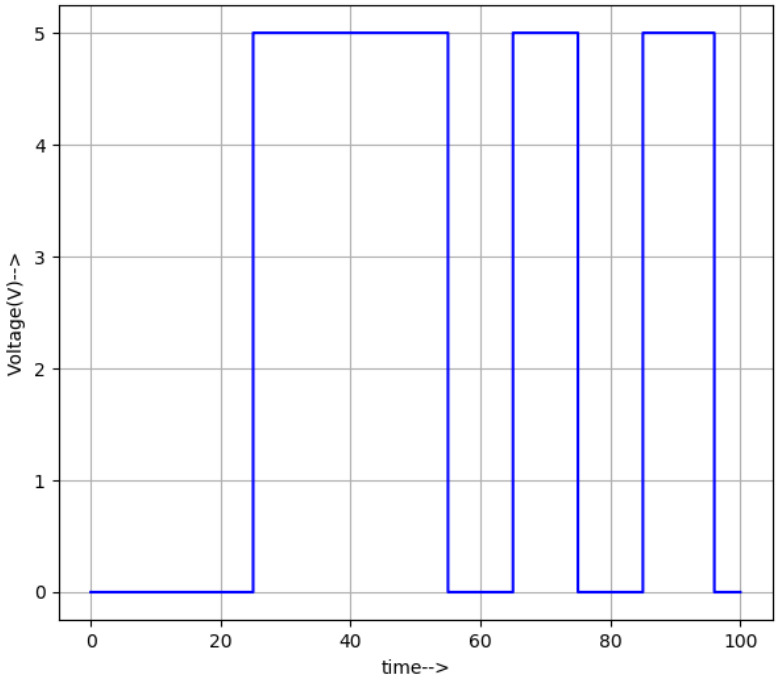
Plot 1: Clock Signal



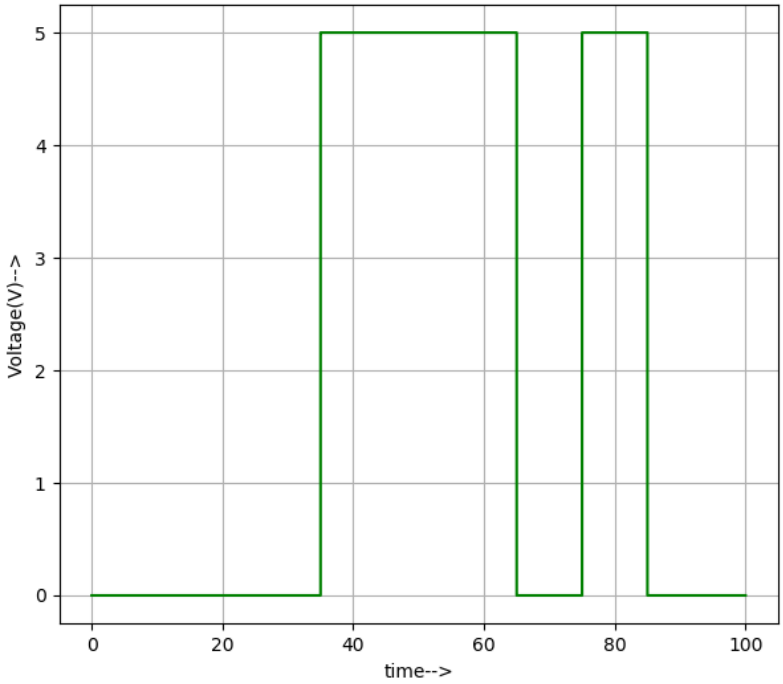
Plot 2: Orientation Signal



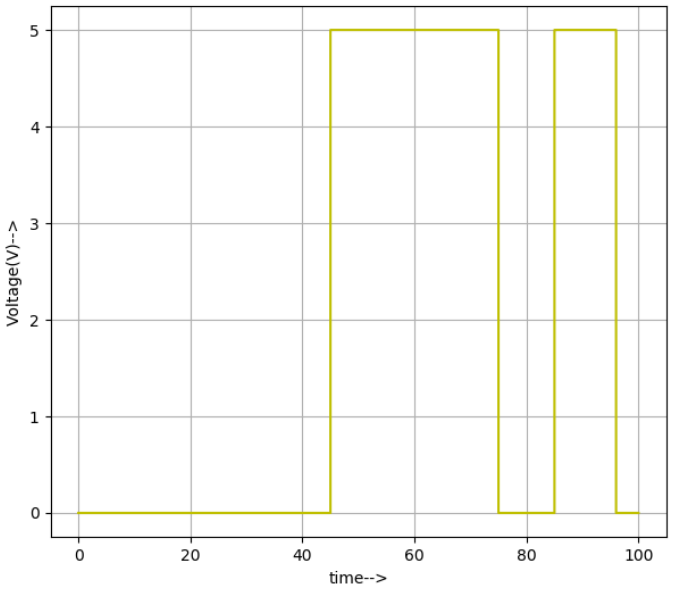
Plot 3: Output of Flip Flop 1



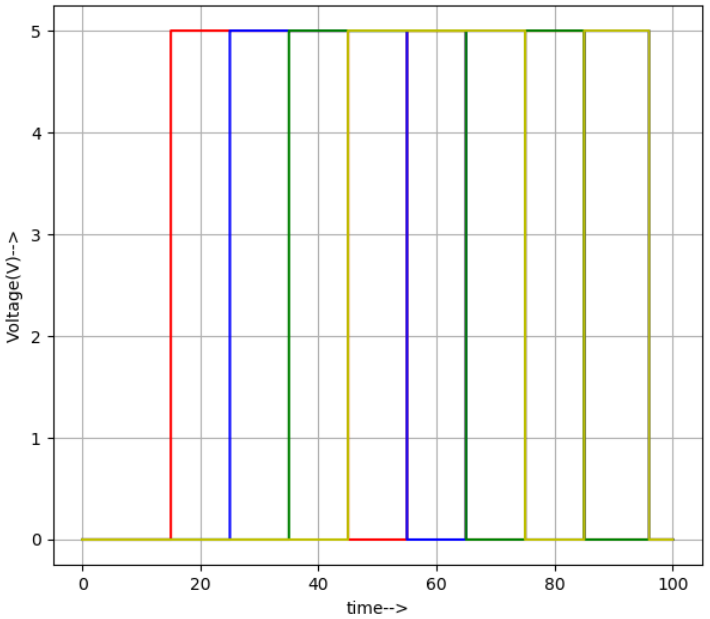
Plot 4: Output of Flip Flop 2



Plot 5: Output of Flip Flop 3



Plot 6: Output of Flip Flop 4



Plot 7: Output of All the Flip Flops

Source/Reference(s):

1. **Made Easy Digital Electronics Theory Book for GATE**