4-BIT JOHNSON COUNTER WITH RING OSCILLATOR

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Abstract

This paper aims in the study of the 4-bit Johnson Counter with Ring Oscillator.It mainly focuses on the mixed signal circuit design.In this design,a 4 bit Johnson counter is implemented using Verilog code and ring oscillator is implemented using CMOS logic.As computer system consists of sequential circuits mostly, it is very important to design sequential circuits effectively and flawlessly for ensuring least power dissipation and architectural simplicity. Different kinds of counters are considered to be very important segments of sequential circuit system. In this paper, we have proposed a design scheme to develop a Johnson counter with ring oscillator as clock input.

Simulation Result

A Johnson counter is a k-bit switch-tail ring counter with 2k decoding gates to provide outputs for 2k timing signals. A k-bit ring counter circulates a single bit among the flip-flops to provide k distinguishable states. The number of states can be doubled if the shift register is connected as a switch-tail ring counter. A switch-tail ring counter is a circular shift register with the complemented output of the last flip-flop connected to the input of the first flip-flop.The circular connection is made from the complemented output of the rightmost flip-flop to the input of the leftmost flip-flop. The register shifts its contents once to the right with every clock pulse, and at the same time, the complemented value of the E flip-flop is transferred into the A flip-flop. CMOS Ring oscillator is the most popular oscillator topology in recent days due to its CMOS technology advantages. In this architecture the last inverter's output is connected to the first inverter's input through a feedback path. It is known as the ring oscillator because of inverters are connected in ring fashion. The number of inverter stages in this oscillator mainly depends on the frequency which we want to generate from this oscillator.

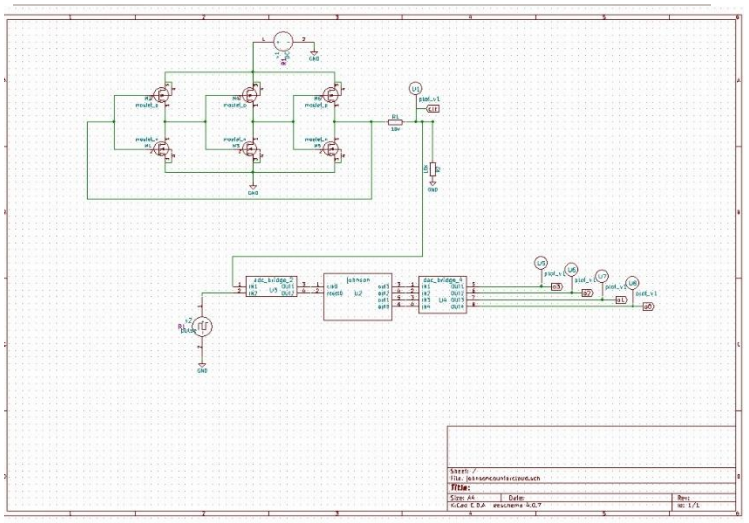
Time period of ring oscillator(T)=2*n*T_d

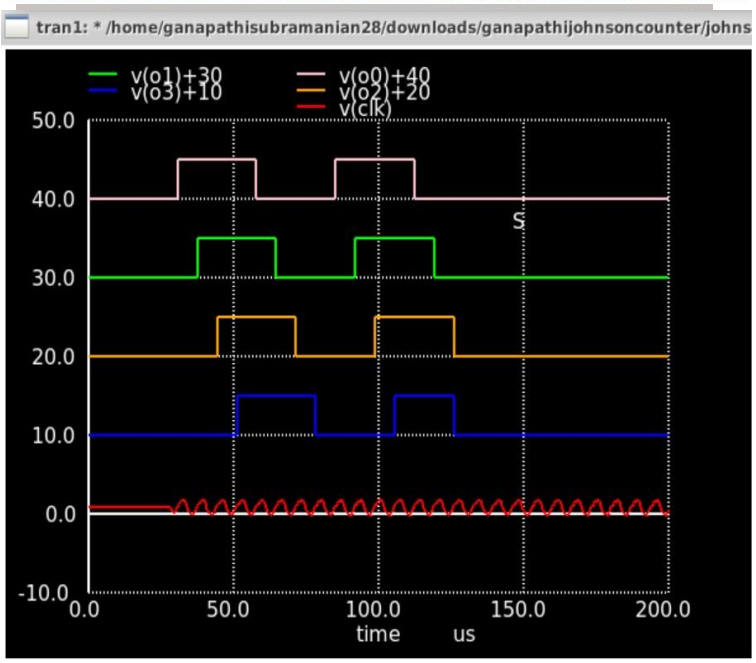
T_d=Propagation delay of each inverter

Frequency of ring oscillator(f)=1/T

n=Number of inverters

The frequency of oscillation is dependent on the number of stages and delay time of each inverter stage.





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