

Blitz Chess Down Counters

Introduction:

Chess is a game played by over 700 million people around the world. Chess game matches can take various forms depending on the users desired setting. I will design and simulate (Multisim) three down counter clocks that will undertake the sequence of falling numbers. The clocks are to be used for a game of blitz chess, a game in which the players will each have a clock with specified time to make a move or forfeit the game if the clock time runs out. The third clock will have the match time, in which If the timer expires, the game will end in a tie. The purpose for the project is to design down counters that can be used at different settings, appropriate to the chess players desired setting.

Method:

For the onset design aspects of the game, I have chosen that the match clock to be a total of 300 seconds (5 minutes)/5minutes. The two clocks used by the players to make a move will be set to 10 seconds each. There are several ways to design a down counter clock, I have chosen to design the user clocks utilizing JK flip flops based on a truth table implementation for the timing sequence. Using the truth table, the optimal logic requirements to implement the flip flops are determined. For the game clock, I have chosen to utilize a 74193 synchronized counter, the 4 bit up/down counter along with logic components can be used to various timing sequences. A different counter will be used for each clock display, as compared to using the same design of the flip flops for the users clocks.

Results:

After obtaining our equations for connecting the four flip flops(since counting begins at 9), I was able to begin my design implementation. Using Multisim, I used a Hex display for the clock display, connecting a Vcc source, and clock voltage source with ground. Following the equations determined for sequence, AND & OR gates are also implemented in the design. The design connects flip flops to the display by bit logic, and a switch to clear the flip flop to restart the clock. I used the same design for the two user clock since the clocks have the same functionality. Since the point of the design is for a player to make a move before the timer reaches zero, which if successfully performed, stops the user's clock and the opponents clock begins, repeating the cycle. The following implementation is achieved by connecting both clocks to a interactive push switch, which would effectively produce the desired results.

The 74193N counter will also be connected to a Hex display, each design will utilize the load/rest component. For the synchronized down counter, resetting the sequence to act as a clock requires connecting the bit sequence to the load. For each design, connecting the bit 1111/15th would reset our counter at zero(as soon as the down counter reaches the 1111 bit it resets). Utilizing the clock frequency, the counters begins at a 9 and 5(for seconds), and at 2(for minutes), this effectively gives the match clock to be set at 3 minutes. By adding a fourth and fifth clock/counter which relate to the user's chess move clock, the counters are able to record the number of moves by the chess players.

Limitations:

The process of designing the user clocks to start at the end of the end of opponent clock cycle was challenging. I first tried to utilize separate switches is for each clock, I was able to reset the clock but not able to begin the user's next clock as my design required. I was able to utilize a interactive switch button which yielded the results for the design. For the overall game clock, I also investigated how I can efficiently use the same design for different Hex displays to perform as intend for the overall design. I found that by changing the frequency of clock to the displays would allow me to use the same design for all. For the sake of a blitz chess match, my design for the user's chess move counters were limited to a counting sequence of 20.

Discussion:

The designing of the down counters was implemented to be adjustable and have flexibility. The down counters can each be modified to the users desired settings. For example, the game down counter clock can be switch to a up counter, where it begins at zero and ends at 3 minutes. Also the game clock can be adjusted easily by switching the connections of the counter(2,5,7, or 10 minutes) based on the users setting on game play. Further more, the user's move clocks can also be adjusted in the design (8,7,6, & 5 seconds for more competitive play), although not as easily as the 74193N counter. For the sake of a blitz chess match, my design for the user's chess move counters were limited to a counting sequence of 20. This among the other components are easily configurable by resetting the 74161N, so that the output will be 1 once the sequence is meet. The design can effectively be used by blitz chess players in practice. Attached is all theory/notes used when designing the down counters.