**User Manual**

**Description:**

Mental Math Binary Game is a system that can be used by a player to test himself/herself in their arithmetic addition skills. The player is checked for a password so he/she can log onto the board and start playing the game. In this game, a random number from 0 to 15 is displayed on the second right most 7-Segment display when a button is pressed. The player should observe the number displayed on the 7-segment display and should mentally convert the number observed into the binary version, then identify the matching number so that the sum of the two numbers is 1111 in binary. Player should then enter the matching number using Player’s set of toggle switches and then press the designated button. The number should be observed on the right most 7-segment display. The sum of the two numbers will be computed by the FPGA and displayed on the third rightmost 7-segment display device. If the sum matches 1111, the second leftmost LED will light up otherwise the leftmost LED will light up. There is a timer of 99 seconds in the game, this will start down counting from 99 to 00 once the player logged into the game and press the game start button. The player can check his/her skills as many times as possible within the time limit.

**Board Picture:**

Diagram, schematic

Description automatically generated

**Step-by-step description of the game:**

1.The player should power on the FPGA board, the game is in Logged Out condition indicated by the second right most led, the timer display (left most 2-7 Segment displays - left most indicates ten’s digit and second left most indicates one’s digit) shows 00. The player should press the reset button and then press the password using the Password switches to login to the game. There are 4 digits in the password (Password:7713). After entering each digit in the password, the player should press the Password Entering button. If the password is correctly entered, the game is logged into which is indicated by the Logged In led, the right most led.

2. When the player logged into the game, the timer displays 99 indicating the timer for the game. If the game start button is pressed now, the timer starts.

3. The player can press the random number generator button to generate the random number which is displayed on the second right most display.

4. After the random number is displayed, the player should enter his/her number so that the sum of the random number and player entered number is 1111(F) and presses the load button. This will show the player entered number on the right most display.

4. The sum is displayed on the third right most display. If the sum is equal to 1111(F), indicated by the two left most Leds (the left most led for non-matching case and the 2nd left most led for matching case), player gets a point. The process is repeated till the timer runs out. The scores are noted and if the player wants to continue playing, he/she can press the game restart button.

5. If the player doesn’t want to play the game again, he/she can press the reset button and log out of the game.