

Optional Assignment 2

QUESTION 1:

Using VHDL and the CAD tool design a logic circuit to display hexadecimal digits on the display. On startup, the digit zero will be displayed. If push button 1 is pressed the next digit will appear. For example if the current digit displayed is '0', pressing push button 1 will cause the number '1' to appear. Another press of push button 1 will cause '2' to appear and so on. If push button 1 is pressed when the current number is 'F' then the output value will wrap around to display '0'.

Push button 2 has the opposite effect: when it is pressed the previous digit will appear (using wrap-around). For example, if the current digit is 'A' and push button 2 is pressed the display will change to '9'. If push button 2 is pressed when the current digit is '0' then the output should wrap around to the value 'F'.

Compile, simulate and download this circuit into UP3. Test the circuit and make sure it is working properly.

QUESTION 2:

Design a digital combination lock using VHDL and the Altera software. The lock can be in two states: locked and unlocked. When locked, the letter "L" is displayed on the display, while the letter "U" is displayed when unlocked. At start-up the circuit should be in the locked state.

The combination of the lock is set in binary by the first four DIP switches. In order to open the lock, the user presses PB1 a number of times followed by one press of PB2. If the number of presses equals the combination, the lock enters the unlocked state. If an incorrect combination is entered the letter "E" is displayed for 2 seconds and then returns to the locked "L" output. Once unlocked, pressing PB2 again resets the lock back to the locked state while PB1 has no effect.

Enter your design in VHDL, compile and simulate it. Download your design to the UP board to verify your design works.