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CSCE-313-002 Embedded Systems

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Project 3

1.0

Logical Elements	Registers	Total Pins	Memory Bits
3320	1969	53	604672

2.0

Since we are using more PIO components, more pins are used in this project. Performing relatively larger operations, like controlling several 7-segment displays, uses more logical elements than powering a handful of LEDs. Since we are performing more operations and storing more values, more registers are utilized.

3.0

1. What is the maximum width that the PIO components can have and why?
    a. The maximum width that PIO components can have is based on the amount of data pins they have. In our case, we have 8 bits and therefore 8 pins. Other controllers could have more, though, this would just increase the complexity of the controller.
2. What is the hardware the function that is used to display the value 0x55 on LEDs?
    a. To write the value 0x55 to LEDs, you would display the desired output with the following code: "IOWR_ALTERA_AVALON_PIO_DATA(base, value);" where base is the base address of the LEDs, and value is 0x55.
3. What is the total number of I/O pins that is used in a system which includes four seven-segment and four push button switches, in addition to clock and reset?

      a. This system uses 53 pins. The system flow summary displays how many pins were used for this program, including the pins used for the IO.

4. You have an FPGA chip which consists of 2000 LEs. How many LABs (Logical Array Block) are there?

      a. 125. Each LAB contains 16 LE's.

5. Briefly explain the difference between Bare-Metal software and General-Purpose software (has Windows and Linux OS).

      a. Bare-metal software is also known as firmware. It's designed to run directly on the hardware of a device without an underlying operating system. General purpose software ,on the other hand, is designed to run on top of an operating system such as Windows or Linux. It is written in higher level program code such as C++ or Python, so it has broader uses for it while Bare-Metal is created specifically for a piece of hardware.