Lab 5: Seven-Segment Display

The purpose of this lab is to use multiple seven-segment displays simultaneously. Make a design that uses the seven-segment display on your Basys 3. **You must be able to show multiple *different* digits simultaneously.**

Study the connections of the seven-segment display on your Basys 3 carefully from the Basys 3 manual. As you will see, you can only light up one digit at a time. To display multiple digits, you will make use of a phenomenon called "persistence of vision" (https://en.wikipedia.org/wiki/Persistence_of_vision). You will turn displays on and off very quickly in turn to create an illusion that they are lit at the same time.

1) Answer in your report:

   - What is the internal clock frequency of Basys 3?
   - How can you create a slower clock signal from this one?
   - Can you create a clock with any arbitrary frequency lower than that of the internal clock? If not, which frequencies can you create?

   Write a counter with sufficiently high frequency to achieve the "persistence of vision" effect. You may check sample counter and clock divider codes on the internet. Next, you will need to write a decoder to choose which display to light up, and a mux to select which digit to display. Implement these and the rest of your design in VHDL. Run a simulation for the seven-segment display module and put the result in your report. Program your device. Show it working to your TA and get their approval. Do not forget to put sample photos of the working device in your report.