Assignment 1

Due: Tuesday, January 21, 2020, 11:30 a.m.

Instructions:

- Answer the questions for DE2-115 Computer
- This assignment serves as the preamble for the first lab.
- Do not submit your assignment. An in-class quiz will be held after the due date.

Part I

Part I of this lab is to learn how to use seven-segment displays and pushbuttons in DE2-115 Computer. An existing interrupt example will be used as a template.

Perform the following:

1. Create a new folder, named de2io_part1 to hold your Monitor Program project for this part.
2. Make a new Monitor Program project named de2io_part1. At the step of "Specify a program type":
   - Check "Include a sample program with the project"
   - Select Interrupt Example to copy the following files to de2io_part1 project.
     C:\<interrupt example folder>\exception_handler.c
     C:\<interrupt example folder>\interrupt_example.c
     C:\<interrupt example folder>\interval_timer_ISR.c
     C:\<interrupt example folder>\address_map_nios2.h
     C:\< interrupt example folder>\pushbutton_ISR.c
     C:\<interrupt example folder>\globals.h
     C:\<interrupt example folder>\nios2_ctrl_reg_macros.h
3. Modify the C program to display a decimal digit on the seven-segment display HEX0. The other seven-segment displays on your DE-series board should be blank.
   - Initially the number displayed on HEX0 should be 0.
   - HEX0 should increment every 1 second. Rather than using a delay loop, the Interval Timer in the DE2-115 computer must be used to measure an exact of 1 second.
   - HEX0 rolls back to 0 after reaches 9.
   - Pressing any KEY should trigger an interrupt to reset the display to 0.
4. Compile, download and test your code.

Part II: Countdown Timer

Part II of this lab is to implement a countdown timer that displays remaining time on HEX5-4.

Perform the following:

1. Create a new folder, named timer_part2 to hold your Monitor Program project for this part.
2. Create a file called timer_part2.c
3. Write a C program that displays time on the seven segments HEX7-4.
   - Time should be in the accuracy of at least 0.25 seconds
   - The initial value should be 30 seconds.
   - When the timer reaches 00, it should roll back to 30 seconds.
   - Toggle between run and stop when any KEY is pressed.

4. Make a new Monitor Program project in the folder where you stored the timer_part2.c file.
5. Compile, download, and test your program.
6. Calculate the accuracy of your real-time clock (deviation per month).