Lab 5 Exercise
Using an FPro SoC with a Custom Hardware Core

Design, implement and verify an FPro system and a corresponding application in C/C++ capable of performing the following operations.

After power-up, the system should wait for the first press of BTNR. All remaining buttons should be ignored. All seven-segment displays should be off.

Task 1: Initialization

Each time BTNR is pressed, an array
  unsigned char hw_data[256]
is initialized as follows
  hw_data[i] = i   for i=0..255.
Then, the circuit enters the Display Mode with the Current Index i set to 0.

Task 2: Display Mode

In the Display Mode, a user should be able to browse the contents of the array hw_data[ ] using the following user interface:

Seven-Segment Displays 3 and 2: Current Index i in the hexadecimal representation.
Seven-Segment Displays 1 and 0: Value of hw_data[i] in the hexadecimal representation.
BTNU should increment the Current Index i in a wrap-around fashion (i.e., "FF" should be followed by "00").
BTND should decrement the Current Index in a wrap-around fashion (i.e., "00" should be followed by "FF").

Task 3: Rotation

Pressing BTNC should initiate Rotation. Rotation should involve
  A. transferring all input data from the array hw_data[ ] to the internal memory of the Rotation core,
  B. rotating each location of the internal memory of the Rotation core to the right by 4 bits,
  C. transferring results back to the array hw_data[ ].
After Rotation is completed, the core should return to the Display Mode, with the last value of the Current Index i preserved.

Deliverables:

1. I/O register map of the Rotation core
2. New or revised VHDL Code [other than the original code of the Sampler FPro system]
3. New or revised C/C++ Code, including a driver, test program, and the main application
4. Video demonstrating the operation of your application.