

PRE-LAB

1. Design a sequential system that display a sequence of number on a seven segment display (SSD) based on one input signal, x . Use one-hot encoding method for this lab.

Requirements:

- When $x = 0$, the system sequences through 0, 1, 2, 3, 4, 0, 1, 2, ... (0 to 4 and repeat)
 - When $x = 1$, the system sequences through 2, 3, 4, 5, 6, 7, 2, 3, ... (2 to 7 and repeat)
 - If at any time, the system displays 5, 6, or 7 and $x = 0$, the next number should be displayed is 3.
 - If at any time, the system displays 0, or 1 and $x = 1$, the next number should be displayed is 3.
- a. Draw an ASM diagram for your design.
 - b. Derive the next state and output equations for your design.
 - c. Draw a circuit diagram for your design. Use DFFs. If the *reset* signal is low or 0 (active low), the system should start the sequence at 3. (Hint: use *CLR* and *PRE* options of the DFFs to reset your system to a specific state).

LAB

1. Implement the sequential system designed in the PRE-LAB section on a DE2 board.

Requirements:

- a. Each number should be displayed on a SSD for one second (1 Hz).
- b. Use *KEY0* for the *reset* signal.
- c. Use *SW0* for the x signal.
- d. Use *HEX0* for the output 7-segment display.

Demonstrate a working circuit to your instructor.