ECE 270 Lab Verification / Evaluation Form

Experiment 10

Evaluation:

IMPORTANT! You must complete this experiment during your scheduled lab period. All work for this experiment must be demonstrated to and verified by your lab instructor *before the end* of your scheduled lab period.

STEP	DESCRIPTION	MAX	SCORE
Pre-lab 1	Draw state transition diagram	5	
Step 1	Create clock divider	2	
Step 2	Create scrolling display shift register	6	
Step 3	Create character sequence generator	6	
Step 4	Thought questions	6	
	TOTAL	25	

Signature of Evaluator: _____

Academic Honesty Statement:

"In signing this statement, I hereby certify that the work on this experiment is my own and that I have not copied the work of any other student (past or present) while completing this experiment. I understand that if I fail to honor this agreement, I will receive a score of ZERO for this experiment and be subject to possible disciplinary action."

Printed Name:_____ Class No. __ __ __ __ - __

Signature:_____ Date: _____

Scrolling 7-Segment LED Display

Instructional Objectives:

- To practice creating a sequence generator

Prelab Preparation:

- Read this document in its entirety
- Review the referenced Module 3 lecture material

Experiment Description:

Write a Verilog module for the 4256ZE Development Board that displays four different character sequences on the four 7-segment LED displays, as indicated in the table below. Two control signals (entered on DIP1 and DIP0) will be used to specify the mode of operation, as follows (if the display mode is changed mid-sequence, the newly-selected sequence should start *at its beginning*, with a *leading blank*):

DIP1	DIP0	*Function*
0	0	*blank* → g → o → *blank* → P → U → r → d → U → E → …
0	1	*blank* → n → o → i → S → E → …
1	0	*blank* → b → o → i → L → E → r → *blank* → U → P → …
1	1	*blank* → r → E → A → L → *blank* → b → i → g → …

The selected sequence should scroll across the four 7-segment displays (`DIS4..DIS1`) from right to left, i.e., the first character of the sequence should initially appear on the right-most display, then *shift left* one position as the next character appears on the right-most display, etc. The sequence generator should be clocked by the internal oscillator divided by two.

Pre-lab Step (1):

On a separate sheet, draw a state transition diagram that specifies the behavior of the scrolling display – either a Mealy or a Moore model may be utilized. Note that a common "leading blank" can be shared by all four sequences.

Step (1):

Create a counter that divides the on-chip oscillator (`tmr_out`) by four, producing a clocking signal of approximately 1 Hz. Route the output of your clock divider to LED28.

Step (2):

Create a 7-bit wide, 4-word "left shift" register to facilitate the display scrolling. Route each "word" of the shift register's outputs to the corresponding 7-segment display (DIS1–DIS4). Route DIP0–DIP6 to the inputs of the shift register's right-most word. Clock the shift register using the internal oscillator divided by four. Use DIP7 to provide an asynchronous reset to all flip-flops. Change the DIP switch values as the display is scrolling to verify correct operation. Demonstrate the scrolling display of manually-entered codes to your Lab Instructor.

Step (3):

Realize the state machine you designed for pre-lab. Clock the character sequence generator state machine using the internal oscillator divided by four. Use DIP7 to provide an asynchronous reset to all flip-flops. Demonstrate the completed scrolling display to your Lab Instructor.

Step (4): Write your answers to the following Thought Questions in the space provided**.**

1. Examine the fitter report generated by ispLever and determine the total number of flip-flops utilized by your design as well as the total number of P-terms and macrocells.

   Number of flip-flops: _____

   Number of P-terms: _____

   Number of macrocells: _____

2. Describe how your design would be different if you used the "other" state machine model (i.e., if you had used a Mealy Model rather than a Moore Model, or vice-versa).

   _____

   _____

   _____

3. Describe how your design would be different if any of the character sequences were longer (than specified) or there were more character strings (than four).

   _____

   _____

   _____

4. Describe how your design would *simplify* if the restriction were eliminated that the "newly selected" sequence did *not* have to start at its beginning.

   _____

   _____

   _____

