Experiment No. 6
Transformer Principles
ECE 213

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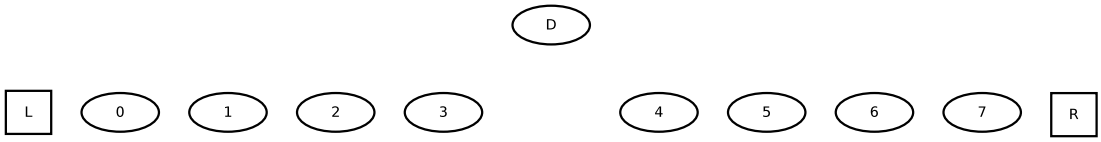
1 Introduction

PLDs can be used to quickly implement logic equations. All combinational logic equations can be expressed using by ANDing complemented or uncomplemented inputs, then ORing the factors together. If the outputs of the PLD serve as the inputs to Q flip-flops, sequental logic can also be implemented.

2 Background

The below is a possible schematic diagram of the ping-pong circuit.



In the diagram, the numbers $0-7$ represent LEDs driven by the outputs of D flip flops, the letters L and R represent a button for the left and right paddle, and D represents a D flip-flop to determine direction. The combinational logic for the circuit is:

$$7 = 6 * R + 0 * L \tag{1}$$

$$6 = 5 * D + 7 * \bar{D} \tag{2}$$

$$5 = 4 * D + 6 * \bar{D} \tag{3}$$

$$4 = 3 * D + 5 * \bar{D} \tag{4}$$

$$3 = 2 * D + 4 * \bar{D} \tag{5}$$

$$2 = 1 * D + 3 * \bar{D} \tag{6}$$

$$1 = 0 * D + 2 * \bar{D} \tag{7}$$

$$0 = 1 * \bar{D} + 7 * \bar{R} \tag{8}$$

$$D = \bar{D} * 0 * L + 1 * D + 2 * D + 3 * D + 4 * D + 5 * D + 6 * D + 7 * D * \bar{R} \tag{9}$$

3 Procedure

a. Design logic

b. Flash chip

c. Test circuit

4 Equipment

- PLD
- Computer to program PLD

5 Conclusions

The purpose of this lab was achieved. A ping pong circuit was designed using PLDs. Combinational and sequential logic was reviewed.