

CS240 Lab 8 Assignment

Refer to the lecture notes for Friday 10/31 to help you with this assignment.

Examine the LogicWorks circuit on the next page.

The D latches have 3 inputs: D (data), C (clock), and R (asynchronous reset, active low).

The heavy blue lines are called “breakouts” in LogicWorks, and are a way to group n wires together when drawing the circuit (to make the diagram simpler to draw). In this diagram, the blue lines represent 4 wires.

The triangular symbols are **tri-state buffers** (as labeled in the diagram), and described in lecture. The enable line for the tri-state buffers is active low.

Answer the following questions.

1. Describe the overall purpose of this circuit.

This is a 4x4 memory (4 addresses with 4 bits of data per address).

2. How is the 2x4 decoder used?

The latches are arranged in “rows” of four, where each row represents the 4 bits of data for a particular address. The decoder outputs control which 4 latches are clocked (written to from the data inputs) for a particular address (the 4 latches in the associated “row”). The decoder outputs also enable the tri-state gates at the outputs when reading from an address.

3. What is the purpose of the tri-state buffers

The tri-state buffers eliminate the need for multiplexers when reading 4 bits of data for a specified address. Only 1 bit from each row is allowed through to the outputs because only the tri-states in that column of latches will be enabled for a specific address.

