CE1901 HOMEWORK SET HW7

INSTRUCTIONS

- **Work** these homework problems by yourself on three-hole punched engineering problems paper and on your computer. Purchase engineering problems paper at the MSOE bookstore. Some companies call engineering problems paper an "engineering pad." It is usually green or yellow in color. **Use** the graph paper side **only when drawing graphs**.
- **Do not use calculators** as you work your solutions.
- **Show all work** to receive partial credit.
- **Showing work** means that you illustrate the process you take to complete a problem.
- **Print and three-hole punch** Quartus VHDL, RTL, and simulation waveform diagrams.
- **Print and three-hole punch** this coversheet.
- **Staple** all materials together as your solution packet.
- **Submit** your solution packet at the start of the **second lecture of week 8**.

ASSIGNED PROBLEMS

1. **Given** a 4-bit input bus called A and a 4-bit output bus called B, a **numeric reverser** is a circuit that outputs the input bits in reverse order. In other words, B3 = A0, B2 = A1, B1 = A2, and B0 = A3. **Create** the truth table. **Implement** the numeric reverser as a VHDL with-select multiplexer architecture. **Simulate** to verify correct operation. **Print** VHDL, RTL, and simulation waveforms as part of your submission packet. **Write** written comments on the simulation that demonstrate how you know your solution works.
2. A one-hot detector examines the input bus and determines if exactly one input bit has energy. The detector drives energy onto the output HOT if and only if exactly one input bit has energy. **Create** the truth table. **Implement** the one-hot detector using a VHDL with-select multiplexer architecture. **Simulate** to verify correct operation**. Print** VHDL, RTL, and simulation waveforms as part of your submission packet. **Write** written comments on the simulation that demonstrate how you know your solution works.

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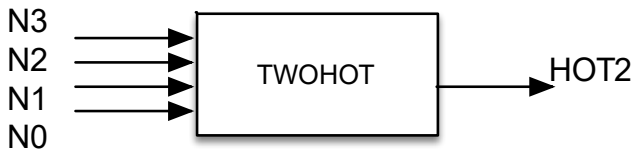
3. A two-hot detector examines the input bus and determines if exactly two input bits have energy. The detector drives energy onto the output HOT2 if and only if exactly two input bits have energy. **Create** the truth table. **Implement** the TWOHOT component using a VHDL with-select multiplexer architecture. **Simulate** to verify correct operation**. Print** VHDL, RTL, and simulation waveforms as part of your submission packet. **Write** written comments on the simulation that demonstrate how you know your solution works.



4. An energy blotter takes a 4-bit input number and removes the energy from the least significant bit that has energy. For example, 0000 produces 0000 since no bit has energy. Yet, 0001 produces 0000 as the circuit blots out the least significant energy bit. Similarly, 0110 produces 0100 as the circuit blots out the least significant energy bit. **Create** the truth table with 4-bit input ABCD and 4-bit output Y3, Y2, Y1, and Y0. **Implement** the BLOT component using a VHDL with-select multiplexer architecture. **Simulate** to verify correct operation**. Print** VHDL, RTL, and simulation waveforms as part of your submission packet. **Write** written comments on the simulation that demonstrate how you know your solution works.