ECE 150 Digital Logic Design, Fall 2022
Project 1: 2-bit Multiplier
Due October 12th 2022

Using any of the following CMOS integrated circuits (ICs)

- hex inverter (NOT)
- dual 4-input or quad 2-input AND, OR, NAND, NOR
- 7-segment display driver

implement a combinatorial circuit that multiplies two input binary numbers, A_1A_0 and B_1B_0, and displays the result on LEDs. You will demonstrate the correct output of your circuit at the beginning of class on the due-date, and submit a typed PDF report.

Circuit Requirements:

- Provide inputs $A_1A_0B_1B_0$ via a 4-input DIP switch (active-high) from left to right.
- Use no more than two breadboards.
- Use red wire for 5V and black for ground.
- Display your output on active-low LEDs (exclusive-)or 7-segment display.

Report Requirements:

- Introduction: restate the problem in your own words
- Methods: detail how you arrived at your implementation. You must include,
    - a truth-table
    - a derivation of your final implemented expression (boolean algebra or K-map)
    - logic diagram(s)
- Implementation: detail your circuit, including,
    - a circuit schematic
    - a picture of your circuit with labeled ICs
- Conclusion:
    - What did you learn?
    - What was the most difficult part of the project?
    - What would you do differently next time?

Grading:

- Correct truth-table (15 pts)
- Circuit (45 pts)
- Report (45 pts)

Additional Considerations:

- Circuit
  - Neatness (color coding, right-angles only, no crossing wires) (+2/100 pts to midterm exam)
  - 7 segment display or individual LEDs
  - Number of ICs used (+3/100 pts to midterm exam for 2 ICs, +2/100 pts for 3 ICs (not including 7-seg. driver))
  - If using 7-segment display driver chip, circuit correctly follows datasheet recommendations

- Report
  - Consistent typesetting
  - Schematics and diagrams done in CAD (or hand-drawn EXTREMELY NEATLY)
  - Correct use of technical terms

You may find it helpful to make use of simulation software, such as Logisim or Logisim-Evolution. Such simulations of your project will be required starting next project.