CSE260: Digital Logic Design

Assignment 3

Submission Link Section 01: Here
Submission Link Section 02: Here

For all the following: Make sure that your circuit is efficient, meaning you should use the lowest number of components. You may use external gates if required.

Lecture - 7:

1. Build an adder-subtractor (4 bits)
2. Draw the block diagram of a 12-bit parallel adder.
3. Build a 13-person voting system using full and parallel adders.
4. Consider A is a 4-bit number. Design A - 3 using a 4-bit parallel adder. Use external gates if required.
5. Consider A is a 4-bit number. Design A + 3 using a 4-bit parallel adder. Use external gates if required.
6. Consider two numbers: 7 and 5. You can only calculate addition and subtraction between those two numbers. Design a circuit that can perform the above calculations based upon the user's intention.
7. Design a full adder using two half adders. You must use three NAND gates and no OR gates.
   # Design a full adder using two half adders. You must use two NOR gates and no OR gates.

Lecture - 8:

8. Construct a circuit with necessary components that convert a 3-bit 1s complement number to its actual 3-bit binary form.

9. Construct a circuit with necessary components that convert a 3-bit 2s complement number to its actual 3-bit binary form.
10. Implement the following boolean function using a single 16:1 mux. F(A,B,C,D) =∑(0,1,2,7,8,10,11,13, 15). Use external gates if required.
11. Implement the following boolean function using a single 8:1 mux. F(A,B,C,D) =∑(0,1,2,7,8,10,11,13, 15). Use external gates if required.
12. Implement the following boolean function using a single 4:1 mux. F(A,B,C,D) =∑(0,1,2,7,8,10,11,13, 15). Use external gates if required.
13. Implement the following boolean function using both 4:1 and 2:1 mux in a single circuit. F(A,B,C,D) =∑(0,1,2,7,8,10,11,13, 15). Use external gates if required.
14. Implement the following boolean function using
    a) 4x16 decoder(s) only
    b) 2x4 decoder(s) only
    F(A,B,C,D,E) =∑(0,1,2,7,8,10,11,13, 15,18,21,24,25). Use external gates if required.
15. Build a BCD to Excess-3 code converter using encoder(s) and decoder(s).
16. Build a BCD to Excess-5 code converter using encoder(s) and decoder(s).