ENG-2410 Assignment #5

School of Engineering, University of Guelph
Fall 2025

Start Date: Week #5, Due Date: Week #7 (Friday, 5:00 PM) in Dropbox

Answer all questions.

1. A Boolean Function is expressed as $F(A, B, C, D) = \sum m(3, 5, 6, 8, 9, 12)$ Assume that **A** is the MSB and **D** is LSB.

   (a) **Implement** F using a single decoder.
   - **Determine** the size of the decoder.
   - **Draw** the circuit diagram and show all your connections.

2. Implement a Binary Full Adder with multiplexers. The Binary Full Adder has three inputs (X,Y,C_{in}) and two outputs Sum (S) and Carry (C).

3. **Subtract** the following numbers (show your steps):

   (a) $(1001)_2$ and $(0111)_2$

   (b) $(1110)_2$ and $(1001)_2$

   (c) $(1101011)_2$ and $(0110011)_2$.

4. Obtain the 10's complement of the following 6-digit decimal numbers: **004567, 583210, 100000**.

5. Obtain the 9's complement of the following 8-digit decimal numbers: **90419910, 21569741, 01010100**

6. Perform the indicated subtraction with the following unsigned decimal numbers by taking the 10's complement of the subtrahend:
   (a) 5678 - 2345 (b) 1995 - 2188 (c) 30 - 120 (d) 2048 - 721

7. Perform the indicated subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend:
   (a) 11011 - 10000 (b) 10110 - 1011 (c) 100 - 101000 (d) 1011100 - 1011100

8. The following binary numbers have a sign in the leftmost position and, if negative, are in 2's complement form. Perform the indicated arithmetic operations and verify the answers.
   (a) 101111 + 111011 (b) 001011 + 100010 (c) 110001 - 001110 (d) 101010 - 110111

9. **Represent** the decimal numbers $(694)_{10}$ and $(845)_{10}$ in BCD. Show the steps necessary to form the sum of the BCD numbers.

Deliverable

- **Name your file** as follows: ENG2410_F25_Assignment5_LastNameFirstName.pdf
- **Write** your name, the course # and Term # on the first page of your submission (i.e solution).
- **Submit** a single PDF file of your solutions.
- **Upload** your PDF file in the Course Link dropbox.
- **Late** submissions are not accepted.
- Your solution of the assignment will **not be accepted** via email.
- To **receive 100% of the mark** you should attempt all questions.
- Solutions to the assignment will be posted at 5:30 PM on Fridays.
- If you have any questions related to the assignment, please **contact your Teaching Assistant** responsible for your Tutorial Section.
- Failing to follow the instructions above will lead to a ZERO grade!!