ENG-2410 Assignment #2

School of Engineering, University of Guelph
Fall 2025

Start Date: Week #2, Due Date: Week #3 (Friday, 5:00 PM) in Dropbox

Answer all questions and show your steps.

1. **Draw** the logic diagram for the following Boolean expressions. The diagram should correspond exactly to the equations. Assume that the complement of the inputs are not available (in other words you need to use an inverter to get the complement of any variable).
   (a) $W\bar{X}\bar{Y} + \bar{W}Z + XY$
   (b) $A(B\bar{C} + \bar{B}C) + C(BD + \bar{B}\bar{D})$

2. The four inputs to a circuit (A,B,C,D) represent an 8-4-2-1 Binary Coded Decimal (BCD) digit, where A is most significant digit (MSD) and D is least significant digit (LSD). The circuit has two outputs **Y** and **Z**. The first output **Y** is 1 if and only if the BCD number represented by the inputs is exactly divisible by 2. The second output **Z** is 1 if and only if the decimal number represented by the inputs is exactly divisible by 3. Assume that only valid BCD digits occur as inputs (in other words, the outputs Y and Z are zero for inputs that are not valid).
   (a) **Draw** the Truth Table for the problem (4 inputs and 2 outputs).
   (b) **Give** a Boolean expression for Y in terms of A,B,C,D.
   (c) **Give** a Boolean expression for Z in terms of A,B,C,D.
   (d) **Draw** the logic diagram of the circuit.

3. **Extract** the truth table of the following problem, **give** the Boolean expression for "F" and **sketch** the corresponding circuit:
   "The function has 3 inputs (X,Y,Z), and one output "F". The output F is equal to "1" only when both "X" and "Y" are different in value while "Z" is equal to "1". (Note: X is the most significant digit of the input).

4. A combinational circuit has four inputs (A,B,C,D) where A represents the Most Significant Bit. It also has three outputs (X,Y,Z) where X is the Most Significant Bit. XYZ represents a binary number whose value equals the number of 1's at the input. For example, if ABCD = 1011, then XYZ = 011.
   (a) **Draw** the Truth Table for the problem (4 inputs and 3 outputs) as indicated above.
   (b) **Give** a Boolean expression for X in terms of A,B,C,D.
   (c) **Give** a Boolean expression for Y in terms of A,B,C,D.
   (d) **Give** a Boolean expression for Z in terms of A,B,C,D.
   (e) **Draw** the logic diagram of the circuit.

Deliverable

- **Name your file** as follows: ENG2410_F25_Assignment2_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 on time.
- Your solution of the assignment will **not be accepted** via email.
- **Late** submissions are not accepted.
- 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!!