CSC 204: Assignment 2

1. **(10X3 pts)** Using the Digital Works program, draw circuit diagrams (do not simplify the circuits) for the following:
   a) \((A+C).(A+B+D)\)
   b) \(A.B.C + \bar{A}.B.C + A.\bar{B}.\bar{C} + \bar{A}.B.\bar{C} + \bar{A}.\bar{B}.\bar{C}\)
   c) \((A+\bar{C}).(A+B.D)\)
   Make sure to assign “interactive inputs” to each input, name them (A,B,C or D) using the “text” function, and assign a LED to the output. Print using the “Print” function and submit. Do not submit hand-drawn circuits.

2. **(5X3 pts)** Derive the truth tables for the above circuits, by assigning each possible input bit-combination to the circuit, and noting the corresponding state of the output LED by clicking on the “Step” button. You could possibly do this without using the circuits built in Problem 1 (by working out the table manually), but since you have built them anyway, you might as well use them.

3. **(10X3 pts)** Simplify the expressions in Problem 1 using the Axioms and Theorems of Boolean algebra, and De-Morgan's laws. You may also use the truth tables derived in Problem 2. You could (BUT DON'T NEED TO) then draw these simplified circuits in Digital Works, and derive their truth tables to compare with the results of Problem 2, to verify whether your simplifications are correct (equivalent circuits must have identical truth tables).

4. **(10X5 pts)** Simplify the following Boolean expressions using the Axioms and Theorems of Boolean algebra, and De-Morgan's laws:
   a) \((A+B+C).(A.B+A.C)\)
   b) \((A+B+C).\bar{A}+B+\bar{C}\)
   c) \(A.B.C + A.\bar{B}.\bar{C} + A.\bar{B}+\bar{C} + A.B.\bar{C} + \bar{A}.B.\bar{C} + \bar{A}.B.C\)
   d) \(A.B+B.\bar{C} + A.\bar{B}.\bar{C} + A.B.C.\bar{D}\)
   e) \((\bar{A}+B).(A+B+C).(A+B+\bar{C}).(\bar{A}+B+C)\)