COMP 2711 Discrete Mathematical Tools for CS
2014 Fall Semester – Assignment # 7
Distributed: 13 November 2014 – Due: 5pm, 20 November 2014

At the top of your solution, please write your (i) name, (ii) student ID #, (iii) email address and (iv) tutorial section.

<u>Some Notes:</u>

- Please write clearly and briefly. For all questions you should also provide a short explanation as to *how* you derived the solution. That is, if the solution is 20, you shouldn't just write down 20. You need to explain *why* it's 20.

- Please follow the guidelines on doing your own work and avoiding plagiarism given on the class home page. Don't forget to *acknowledge* individuals who assisted you, or sources where you found solutions.

- Some of these problems are taken (some modified) from the textbook.

- Please make a *copy* of your assignment before submitting it. If we can't find your paper in the submission pile, we will ask you to resubmit the copy.

- Your solutions can be submitted before 5PM of the due date, in the collection bin in front of Room 4213A.

Problem 1: Use a truth table to prove the DeMorgan's law that states $\neg(p \wedge q) = \neg p \vee \neg q$.

Problem 2: Which of the following statements (in which Z^+ stands for the positive integers and Z stands for all integers) is true and which is false? Don't forget to explain why.
a) $\forall z \in Z^+ \, (z^2 + 5z + 10 > 17)$
b) $\forall z \in Z \, (z^2 - z \geq 0)$
c) $\exists z \in Z^+ \, (z - z^2 > 0)$
d) $\exists z \in Z \, (z^2 - z = 6)$

Problem 3: Show that the statements $s \Rightarrow t$ and $\neg s \vee t$ are equivalent using a truth table.

Problem 4: (Distributive "Laws")
(a) Is $w \wedge (u \oplus v)$ equivalent to $(w \wedge u) \oplus (w \wedge v)$?
(b) Is $w \vee (u \oplus v)$ equivalent to $(w \vee u) \oplus (w \vee v)$?

Problem 5: (a) Construct a contrapositive proof that for all real numbers x,
if $x^2 - 2x \neq 3$ then $x \neq 3$.
(b) Construct a proof by contradiction that for all real numbers x,
if $x^2 - 2x \neq 3$ then $x \neq 3$.