CPSC 121 Quiz 1
Wednesday, 2012 July 4

Name: _____ Student ID: _____
Signature: _____
Your signature acknowledges your understanding of and agreement to the rules below.

– You have 40 minutes to write the 5 questions on this examination. A total of 20 marks are available.

– You may have as an aide up to 3 textbooks and a 3 inch stack of paper notes and nothing else. **No electronic devices allowed**; so, no cell phones and no calculators.

– Keep your answers short. If you run out of space for a question, you have likely written too much.

– The number in square brackets to the left of the question number indicates the number of marks allocated for that question. Use these to help you plan your use of time on the exam.

– Clearly indicate your answer to each problem. If your answer is not in the provided blank, then indicate where the answer is, and at the answer's location indicate the question it addresses.

– **Good luck!**

Question	Marks
1	
2	
3	
4	
5	
Total	

UNIVERSITY REGULATIONS:

– Each candidate should be prepared to produce, upon request, his/her UBC card.

– No candidate shall be permitted to enter the examination room after the expiration of one half hour, or to leave during the first half hour of the examination.

– CAUTION: candidates guilty of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.

1. Having at the place of writing, or making use of, any books, papers or memoranda, electronic equipment, or other memory aid or communication devices, other than those authorised by the examiners.
2. Speaking or communicating with other candidates.
3. Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

– Candidates must not destroy or mutilate any examination material; must hand in all examination papers; and must not take any examination material from the examination room without permission of the invigilator.

[2] 1. Here's a short version of a statement from the UBC calendar: "You must meet the promo reqts. If you do not meet them, you do not get to stay in the Faculty."[1]

Let m mean "I met the promo reqts." Let s mean "I stay in the Faculty."

Give a propositional logic statement with the same meaning as the statement above. (Be careful; a direct translation probably isn't useful. Instead, write a statement with the same truth table as the English statement.)

[4] 2. Write a circuit that corresponds *directly* to $\sim(\sim m \vee (m \wedge p))$.

[3] 3. Write out a truth table for the statement $\sim(\sim m \vee (m \wedge p))$.

[1] NOT RELEVANT TO THE QUIZ. Here is the full version (lightly edited): "Students must meet the second-year promotion requirements within 48 attempted credits after admission to first year. Those who do not will be required to withdraw from the Faculty."

[2] 4. Actual gates can only send their output along to a limited number of inputs of subsequent gates. Indicate at least one way that the propositional logic model falls short with respect to this issue: failing to capture useful information that *is* present in a circuit diagram.

[9] 5. Write out propositional logic statement(s) that could be directly translated into a circuit for this problem: given a 3-bit number as input, produce the largest factor of the number other than itself as output. As special cases, 0 and 1 should both produce 0. The output should be a 2-bit number. (So, for example, 7 produces 1 because it has only 1 and itself as factors. 6 produces 3 because it has 1, 2, 3, and itself as factors.)

Reminders: For a 3-bit number, 000 = 0, 001 = 1, 010 = 2, 011 = 3, 100 = 4, 101 = 5, 110 = 6, and 111 = 7. For a 2-bit number, 00 = 0, 01 = 1, 10 = 2, and 11 = 3. A factor of a number is a positive integer that divides that number.

CLEARLY SHOW YOUR WORK for partial credit.

BONUS: Earn up to 2 bonus points by doing one or more of these problems.

- Draw the simplest possible circuit to solve the last problem above. (Otherwise, you don't need to draw a circuit for that problem at all.) Hint: simplify your propositional logic first!

- There's a gate called a "buffer" with the truth table:

in	out
T	T
F	F

This seems useless, but something on this quiz gives one of the justifications for the gate. Give a clear example of how and why we might use the buffer, including how best to use it when the problem it solves is severe.