CSC465/2104 Test 0 2024 September 26 4:10pm

1 page, 4 questions, 42 marks, 50 minutes
Aids allowed: one letter-sized page, both sides
and the laws from the textbook, 14 pages

The value of each question is indicated in square brackets.
A blank answer is worth about one-third of the marks;
to that, marks will be added for readable and relevant and correct information,
and marks will be subtracted for unreadable or irrelevant or incorrect information.

1 Let a and b be binary variables. Using the proof format and laws in the textbook, prove

(a)[6] **if** b **then** c **else** $\neg c$ **fi** = **if** c **then** b **else** $\neg b$ **fi**

(b)[12] **if** b **then if** c **then** P **else** R **fi else if** d **then** Q **else** R **fi fi**
= **if if** b **then** c **else** d **fi then if** b **then** P **else** Q **fi else** R **fi**

2[3] Let A be a bunch of binary values such that $A = \neg A$. What is A? (answer only, no proof)

3 Let $B = 1, 3, 5$. What is (answer only, no proof)

(a)[3] $\not\in(B + B)$

(b)[3] $\not\in(B \times 2)$

(c)[3] $\not\in(B \times B)$

(d)[3] $\not\in(B^2)$

4[9] There are some people in a bar. Formalize and prove the statement "There's a person in the bar such that, if that person drinks, then everyone in the bar drinks.". Let *people* be the people in the bar, and let *drinks* be a predicate with domain *people*.