

CPSC 121,
2007 Summer, Section 922
Quiz 1

Name: _____

Student ID: _____

Signature: _____

- You have **20 minutes** to write the **3 questions** on this examination.
- A total of 20 marks are available.
- **You may want to complete what you consider to be the easiest questions first!**
- Justify all of your answers.
- No notes or electronic equipment are allowed.
- Keep your answers short. If you run out of space for a question, you have written too much.
- The number in square brackets to the left of the question number indicates the number of marks allocated to that question.
- Good luck!

Question	Marks
1	
2	
3	
Total	

UNIVERSITY REGULATIONS:

- Each candidate should be prepared to produce, upon request, his/her university-issued ID.
- 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.

[8] 1. The table below contains propositions. We say two entries are correctly matched if the two propositions are logically equivalent. The table contains two pairs of matching table entries.

- List the two pairs of matched entries (for instance “A with B, C with D”).
- Then prove that the two entries in one matched pair are logically equivalent, using a truth table.
- Finally prove that the two entries in the other matched pair are logically equivalent, using the equivalence laws discussed in class. Write the name of each law you are applying, and apply **exactly one law at a time**.

A. $p \wedge [(t \wedge \sim p) \vee q]$	C. $\sim p \rightarrow \sim q$
B. $\sim[\sim(t \wedge \sim t) \wedge \sim(p \vee \sim q)]$	D. $p \wedge q$

B matches with C
A matches with D

B:

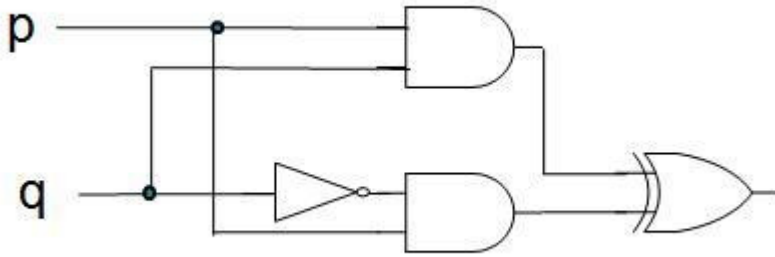
$\sim[\sim(t \wedge \sim t) \wedge \sim(p \vee \sim q)]$	
$\sim[\sim F \wedge \sim(p \vee \sim q)]$	Negation Law
$\sim[\sim(p \vee \sim q)]$	Identity Law
$(p \vee \sim q)$	Double Negation
$\sim p \rightarrow \sim q$	Implication

A:

$p \wedge [(t \wedge \sim p) \vee q]$	
$[p \wedge (t \wedge \sim p)] \vee (p \wedge q)$	Distributive Law
$(p \wedge \sim p \wedge t) \vee (p \wedge q)$	Commutative Law
$(F \wedge t) \vee (p \wedge q)$	Negation Law
$F \vee (p \wedge q)$	Domination Law
$(p \wedge q)$	Identity Law

(one of the pairs needed to be proved with a truth table instead)

[4] 2. Write a compound proposition that is equivalent to the following circuit.



$$(p \wedge q) \oplus (\sim q \wedge p)$$

[8] 3. Determine whether or not the following argument is valid. For each step, indicate which numbered propositions you are using and the name of the inference rule or logical equivalence you used.

- (1) $n \vee t$
- (2) $r \vee m$
- (3) $m \rightarrow \sim n$
- (4) $t \wedge b$
- (5) $r \rightarrow \sim t$
- $\therefore n$

- (6) t Simplification (4)
- (7) $\sim r$ Modus Tollens (6) and (5)
- (8) m Disjunctive Syllogism (7) and (2)
- (9) $\sim n$ Modus Ponens (3) and (8)

The argument is not valid.

