CISC-204*
Test #4
March 22, 2005

Dr. Robin Dawes, Dr. Janice Glasgow

Student Number (Required) _____

Name (Optional)_____

Section _____ (Dawes: A, Glasgow: B)

This is a closed book test. You may not refer to any resources other than the information sheet stapled to the back of the test. You may remove the information sheet.

This is a 50 minute test.

Please write your answers in ink. Pencil answers will be marked, but will not be reconsidered after the test papers have been returned.

The test will be marked out of 40.

Question 1	/8
Question 2	/8
Question 3	/12
Question 4	/12
TOTAL	/40

QUESTION 1. 8 MARKS

State whether the claim is true or false, and **prove your answer**.

Let π be a path in a transition system model M.

If $\pi \models G\ F\ \phi$, then ϕ is true infinitely many times along π

TRUE FALSE

Proof:

(Hint: To prove this is true, suppose ϕ is true only finitely many times along π, then try to derive a contradiction. To prove this is false, try to find a counter-example.)

QUESTION 2: 8 MARKS

... question not relevant in 2013 ...

QUESTION 3: 12 MARKS

Translate each of the following into LTL formulas: ψ

(a) The path π satisfies the requirement that if ϕ is true in the second state of π, then ψ is true in some state in π

(b) The path π satisfies the requirement that at some point in the future, ϕ is true in two consecutive states.

(c) The path π satisfies the requirement that if ϕ is true in any state, then ψ is true in some earlier state.

QUESTION 4: 12 MARKS

Here is a model of a small system. For each of the following LTL statements, determine if the model satisfies the statement. If so, explain how you know this. If not, show a path that demonstrates that the statement is false.

… 2013 … picture a state transition system with 4 states … sorry I don't have the exact system that was used on this 2005 test … make up your own and answer the question for your own system

(a) $s_0 \models (F\ X\ s) \rightarrow (F\ (p \wedge q))$

(b) $s_1 \models (\neg\ s)\ W\ (\neg\ F\ p)$

(c) $s_2 \models (\neg\ F\ r) \rightarrow (G\ F\ p)$

LTL INFORMATION

F: Some **Future** state
X: The **Next** state
G: All states (**Globally)**
U: **Until**
W: **Weak** Until
R: **Releases**

Definitions:

Let π be a path. π^i is the path starting in the i-th state in π

Let π be a path and let ϕ be a formula. $\pi \vDash \phi$ if ϕ is true in the first state in π

Let s be a state in a model and let ϕ be a formula. $s \vDash \phi$ if for every path π that starts in state s, $\pi \vDash \phi$