

CSC 165H1 S February Midterm 2004

Duration — 50 minutes

L0201

Aids allowed: none

Student Number: _____

Last Name: _____

First Name: _____

Tutorial Section:
(circle one)

UC-177
Daniela
Rosu

UC-256
Patricio
Simari

RW-142
Daniel
Ivan

*Do **not** turn this page until you have received the signal to start.*

*(Please fill out the identification section above,
and read the instructions below.) Good Luck!*

This midterm consists of 4 questions on 5 pages (including this one).
When you receive the signal to start, please make sure that your copy is complete.

For 1 bonus mark write your student number at the bottom of pages 2-5
of this test.

1: _____/ 6

2: _____/ 8

If you use any space for rough work, indicate clearly what you want
marked.

3: _____/ 3

4: _____/ 8

If you are unable to answer a question (or part of a question), you will
get 20% of the marks for the question (or part of the question) if you state
clearly that you do not know how to answer. Note that you will *not* get
those marks if your answer contains contradictory statements (such as “I do
not know how to answer” followed or preceded by parts of a solution that
have not been crossed off).

TOTAL: _____/25

Question 1. [6 MARKS]

Consider the statement:

(i) If A then B and C.

Part (a) [1 MARK]

What can be concluded from (i), if B and C are true?

Part (b) [1 MARK]

What can be concluded from (i), if A is true?

Part (c) [2 MARKS]

Write an English sentence that is equivalent to (i), without using “and” (and without using a word that means “and”).

Part (d) [2 MARKS]

Draw a Venn diagram with sets for A, B and C. Make sure that the sets overlap to divide the diagram into 8 regions. Shade in the regions corresponding to where (i) is true, and put an “X” in the regions where it is not true.

Question 2. [8 MARKS]

Let M = the set of all movies

Let $S(x, y)$ = movie x is the sequel to movie y

Rewrite the following English sentences using precise symbolic notation:

Part (a) [2 MARKS]

No movie is a sequel to itself.

Part (b) [2 MARKS]

All movies have a sequel.

Part (c) [2 MARKS]

There is a sequel to every movie.

Part (d) [2 MARKS]

“Pi” is not a sequel.

Question 3. [3 MARKS]

Rewrite the following Java code without using “if” and without using variants like “?:”, “while” and “switch”.

```
if (A) {
    if (B) {
        return true;
    } else if (!C) {
        return false;
    } else {
        return (C && D);
    }
}
```

Question 4. [8 MARKS]

Let \mathbb{N} = the set of nonnegative integers 0, 1, 2, ...

Consider the sentence:

$$(S4) \exists i \in \mathbb{N}, \forall j \in \mathbb{N}, a_j > i \rightarrow j > i$$

about the sequence a_0, a_1, a_2, \dots

Part (a) [2 MARKS]

Express its negation, moving the “not” inside as much as possible.

Part (b) [4 MARKS]

For each of the following sequences, state whether (S4) is true or false. Also, if an example or counterexample justifies your claim, give it.

- 5, 6, 6, 7, 7, 7, 8, 8, 8, 8, 9, 9, ...
- 2, 4, 8, 16, 32, 64, 128, 256, ...

Part (c) [2 MARKS]

Give the direct proof structure outline for (S4).

Use this page for rough work.

You can tear this page off, but we will collect it. You must fill in your student number if you tear it off, and you will lose 20% if you keep this page.

Total Marks = 25

Student #: _____

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END OF EXAMINATION