

**HAND IN**  
Answers recorded  
in question paper

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QUEEN'S UNIVERSITY  
FACULTY OF ARTS AND SCIENCE  
SCHOOL OF COMPUTING

CISC-203\*  
DISCRETE MATHEMATICS FOR COMPUTING SCIENCE

TEST 2  
October 2005

Professor Selim G. AKL

Please write your answer to each question only in the box marked **Answer**.

No questions will be answered by the instructor during the exam.

**This is a closed-book exam. No computers or calculators are allowed.**

If you are unsure of what is wanted for a particular question,

make a reasonable assumption and write this at the beginning of your answer.

PLEASE NOTE: Proctors are unable to respond to queries about the interpretation of exam questions. Do your best to answer exam questions as written.

NAME: \_\_\_\_\_

STUDENT NUMBER: \_\_\_\_\_

FOR INSTRUCTOR'S USE ONLY

Question 1: \_\_\_\_\_ / 5

Question 2: \_\_\_\_\_ / 5

Question 3: \_\_\_\_\_ / 5

Question 4: \_\_\_\_\_ / 5

TOTAL: \_\_\_\_\_ / 20

NAME: \_\_\_\_\_

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**Question 1: [5 marks]**

Let  $n$  be a positive integer. Prove that  $n$  is even *if and only if*  $7n + 4$  is even.

**Answer:**

NAME: \_\_\_\_\_

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**Question 2: [5 marks]**

Let  $n$  be an integer. Prove that  $n^2$  always ends with one of the following digits: 0, 1, 4, 5, 6, or 9.

**Hint:** Assume without loss of generality that  $n \geq 0$ , and write  $n = 10k + \ell$ , where  $k$  is a nonnegative integer and  $\ell \in \{0, 1, \dots, 9\}$ .

**Answer:**

NAME: \_\_\_\_\_

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**Question 3: [5 marks]**

Let  $n$  be an integer greater than 3. Use mathematical induction to prove that  $n^2 - 7n + 12 \geq 0$ .

**Answer:**

**Question 4: [5 marks]**

Give a pseudo-code description of a recursive algorithm for computing the sum of the sequence of numbers  $a_1, a_2, \dots, a_n$ .

**Answer:**