PLEASE HAND IN

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UNIVERSITY OF TORONTO
FACULTY OF ARTS AND SCIENCE

AUGUST 2007 EXAMINATIONS

CSC 104H1
DURATION — 3 HOURS

NO AIDS ALLOWED

STUDENT NUMBER: |_|_|_|_|_|_|_|_|_|_|

LAST NAME: _____

FIRST NAME: _____

Do NOT *turn this page until you have received the signal to start.*
(In the meantime, please fill out the identification section above, and read the instructions below.)

This exam consists of 6 questions on 12 pages (including this one). *When you receive the signal to start, please make sure that your copy of the exam is complete.*

Please answer questions in the space provided. You will earn 20% for any question you leave blank or write "I cannot answer this question," on. You will earn substantial part marks for writing down the outline of a solution and indicating which steps are missing.

Write your student number at the bottom of pages 2-12 of this exam.

1: _____/20

2: _____/17

3: _____/18

4: _____/16

5: _____/ 9

6: _____/10

TOTAL: _____/90

Good Luck!

QUESTION 1. [20 MARKS]

PART (A) [5 MARKS]

In what ways can computers erode our privacy, and in what ways can they protect it?

PART (B) [5 MARKS]

Give some examples of contemporary computer peripherals used to store information, and explain how they do so.

PART (C) [5 MARKS]

How is a web browser running on your computer in Toronto able to communicate with a computer serving a web page in Australia? Explain as thoroughly as you can.

PART (D) [5 MARKS]

What are the similarities and differences of computing the sum of two numbers on an abacus versus computing the sum of two numbers on a modern computer?

QUESTION 2. [17 MARKS]

PART (A) [5 MARKS]

How would you write the following decimal (base-ten) numbers in binary (base-two)? Use any method you like, but show your work.

(a) 59

(b) 75

(c) 100

(d) 136

(e) 115

PART (B) [2 MARKS]

Add the two binary numbers you gave in part (a) and (b). Show your work (all your operations must be in binary).

PART (C) [4 MARKS]

Fill in the missing column in the following logic table, where the NOT operation is represented with a "!", TRUE with "T", and FALSE with "F".

A	B	C	(A AND B AND C) OR (A AND B AND !C) OR (A AND C AND !B) OR (B AND C AND !A)
F	F	F	
F	F	T	
F	T	F	
F	T	T	
T	F	F	
T	F	T	
T	T	F	
T	T	T	

PART (D) [4 MARKS]

Find the 16-bit binary (base-two) number that yields 0000000000000000 when added to 1101000101001110 (you may ignore any carry bit in the left-most column). Explain how you came up with your answer, and its significance.

PART (E) [2 MARKS]

Suppose $00b_5b_4b_3b_2b_1b_0$ is an 8-bit binary number (so each b_i, where $0 \leq i \leq 5$, stands for either 1 or zero). What is the arithmetic relationship between the value of that number and $b_5b_4b_3b_2b_1b_000$, or $0000b_5b_4b_3b_2$?

QUESTION 3. [18 MARKS]

Explain as well as you can what is going on in the following fragments of javascript code, including the state of the variables at each semicolon.

PART (A) [4 MARKS]

```
big = 2; small = 3; big > small; big = big + small; big > small; big = big % small;
```

PART (B) [4 MARKS]

```
big = 2; typeof(big); small = "three"; big = small + big; big = big > small; typeof(big);
```

PART (C) [3 MARKS]

```
one = "two"; two = "one"; one = one > two + one; typeof(one);
```

PART (D) [3 MARKS]

```
list1 = [1,3,5]; list2 = list1; list2[4] = 9; list1[3] = (list1[2] + list2[4]) / 2;
```

PART (E) [4 MARKS]

```
tiles = [1,1]; for (i = 2; i < 10; i = i+1) { tiles[i] = tiles[i-1] + tiles[i-2]; }; tiles;
```

QUESTION 4. [16 MARKS]

PART (A) [9 MARKS]

Read the definition of the javascript function `eCount`, and explain as thoroughly as you can how it works. What do you expect `eCount("Frank")` to return? What about `eCount("feet")`? What about `eCount("Esther")`?

```
function eCount(s1) {
  if (s1.length == 0) return 0;
  else if (s1.substring(0,1) == "e") return 1 + eCount(s1.substring(1));
  else return eCount(s1.substring(1));
}
```

PART (B) [7 MARKS]

Read the definition of the javascript function `pow`, and explain as thoroughly as you can how it works. What do you expect `pow(2,0)` to return? How about `pow(2,3)`? How about `pow(5,2)`?

```
function pow(n1,n2) {
  if (n2 == 0) return 1;
  else return n1 * pow(n1,n2-1);
}
```

QUESTION 5. [9 MARKS]

Explain the significance of the following for computing or computers:

PART (A) [3 MARKS]

transistors

PART (B) [3 MARKS]

intellectual property

PART (C) [3 MARKS]

algorithms

QUESTION 6. [10 MARKS]

PART (A) [5 MARKS]

Consider all the lists of positive integers (whole numbers) that add up to 13. Which of these lists give the largest product when you multiply the numbers in the list together? Explain how you go about finding your answer.

PART (B) [5 MARKS]

What is the maximum number of regions you can divide a piece of paper into using 5 straight lines? Explain how you went about finding your answer.

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Total Marks = 90