UNIVERSITY OF TORONTO
FACULTY OF ARTS AND SCIENCE

TERM TEST #1

CSC 104H1
DURATION — 50 MINUTES

NO AIDS ALLOWED

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 test consists of 6 questions on 7 pages (including this one). *When you receive the signal to start, please make sure that your copy of the test 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.

Good Luck!

QUESTION 1.   [5 MARKS]

Briefly (a few sentences) discuss some similarities and differences between computing hardware from before 1900 and modern computers.

QUESTION 2.   [3 MARKS]

Discuss some advantages of transistors versus vacuum tubes.

QUESTION 3.   [5 MARKS]

Consider the tables for binary addition and multiplication below, then carry out the indicated calculations in binary. Show all intermediate results in binary.

$\times$	0	1
0	0	0
1	0	1

$+$	0	1
0	0	1
1	1	0

  (i) Write 5 as an unsigned binary integer (these don't include bits for $+$ or $-$)

  (ii) Write 11 as an unsigned binary integer

(iii) Multiply the binary numbers 5 and 11. Show all your work (carries, etc) in binary.

(iv) Add the binary numbers 5 and 11. Show all your work.

Question 4.   [5 marks]

Consider the tables for AND, OR, and NOT, and then evaluate the logical expressions below them. Your evaluation of each expression should be exactly one of true or false.

a	b	a AND b
true	true	true
true	false	false
false	true	false
false	false	false

a	b	a OR b
true	true	true
true	false	true
false	true	true
false	false	false

a	NOT a
true	false
false	true

(i) (true AND false)

(ii) (false OR true)

(iii) (NOT (true OR false))

(iv) ((true AND false) OR (true OR false))

(v) ((NOT (true AND false)) AND (true OR false))

Question 5.   [6 marks]

Assume the expressions below have been typed into the definitions pane of DrRacket. Below each parenthesized expression write, draw, or describe its effect when the "Run" button is clicked.

(require picturing-programs)

(flip-horizontal (scale 2.0 pic:hacker))

(rotate 90 (beside pic:hacker pic:hacker))

(triangle (image-width pic:hacker) "solid" "green")

(+ (* 3 4) (+ 3 4))

(or (> 4 3) (> 3 4))

Question 6.   [10 marks]

For each of the two functions beside-scale-flip and mult-rem, I have provided a summary sentence, one check-expect expression, started the define statement, and written an incomplete contract comment (I left out what is consumed and what is produced, after the ":"). You should complete both functions by:

(i) Adding another appropriate check-expect expression for each function

(ii) Completing the define statement with the body of the definition for each function

(iii) Completing the contract comment, saying what is consumed and what is produced for each function

```
(require picturing-programs)

; beside-scale-flip :
; Produce im beside horizontally flipped
; half-sized version of im.
(check-expect (beside-scale-flip pic:calendar)
              (beside pic:calendar
                      (scale 1/2 (flip-horizontal pic:calendar))))




;
(define (beside-scale-flip im)




)
```

```
; mult-rem :
; Produce the remainder of n1 times n2
; after dividing by n3.
(check-expect (mult-rem 3 4 5)
              (remainder (* 3 4) 5))




;
(define (mult-rem n1 n2 n3)




)
```

1: _____/ 5

2: _____/ 3

3: _____/ 5

4: _____/ 5

5: _____/ 6

6: _____/10

TOTAL: _____/34