CPSC 126 SAMPLE Midterm
June 29$^{\text{th}}$, 2002

Name: _____

Student ID: _____

Lab Section: _____

– You have 60 minutes to write the 4 questions on this examination. A total of 50 marks are available.

– No notes, books, calculators, computers, cassette or CD players, or cellular phones are allowed.

– You are allowed **one** 8.5 X 11 two-sided sheet of handwritten notes. No other notes, calculators, computers, cellphones, or palm-pilots are allowed.

– The number in square brackets to the left of the question number indicates the number of marks allocated for that question. Use these to help you determine how much time you should spend on each question.

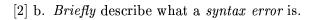| Question	Marks
1	
2	
3	
4	
Total	

– **Justify all your answers**

– Use the back of the pages for your rough work.

– **Good luck!**

UNIVERSITY REGULATIONS:

– No candidate shall be permitted to enter the examination room after the expiration of one half hour, or to leave during the first half hour of the examination.

– CAUTION: candidates guilty of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.

1. Making use of any books, papers or memoranda, electronic equipment, or other memory aid devices, other than those authorised by the examiners.

2. Speaking or communicating with other candidates.

3. Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

– Smoking is not permitted during examinations.

1. Short Answers [10]

    [2] a. *Briefly* describe two differences between C++ and Scheme.

    [2] b. *Briefly* describe what a *syntax error* is.

    [2] c. *Briefly* describe what a *logical error* is.

    [4] d. What is an EBNF used for?

2. Binary numbers [10]

The 8-bit two's complement binary representation of the decimal number 99 is 1100011. There is a table of 4-bit binary numbers on the last page of this exam.

[3] a. Convert this number to hexadecimal.

[3] b. What is the 8-bit two's complement binary representation of -99? Show your work.

[4] c. What would your answer to the last question represent if it was interpreted as an 8-bit **unsigned** integer? show your work.

3. EBNF [15]

A table of stock quotes for the Hyder Stock Exchange (HSE) consists of one or more listings of companies on the exchange. Each company listing starts with the company name, which consists of at most 8 upper and lower case letters, but has the first letter capitalized and must be at least 3 letters long. The company name is followed by the exchange code for that company, which is 3 or 4 upper case letters. Following the exchange code is the trading volume (a whole number > 0). Then comes four real numbers with two decimal places (like 560.95) which give the high, low, close and net change values for the stock. The net change **must** be preceded by a $+$ or a $-$, but the high, low and close values are not. Finally, **if** the stock's value has changed significantly in the last day, the company's listing is preceded by a $\uparrow$ or a $\downarrow$, for increases or decreases, respectively. Write the EBNF for the table of stock quotes on the HSE. You can assume categories for `upper case letter`, `lower case letter` and `digit` have been defined. A table of EBNF symbols is given on the last page of this exam.

4. Euclid's greatest common divisor algorithm (GCD) [15]

Given two integers a and b, the GCD is the largest integer x that divides both a and b evenly. You can assume that $b > a$. Euclid (325-270 BC) showed that if r is the remainder of b divided by a, then the common divisors of r and a are the same as the common divisors of a and b. Thus one can reduce the size of the problem from a, b to b, r. Implement a C++ function to compute the GCD of two integers. The declaration of your function should be `int gcd(int a, int b);`

EBNF symbols

[...]	means optional
{...}	means zero or more
"..."	means as-is
|	means or
( )	are used for grouping

4-bit binary numbers

binary	decimal	hexadecimal
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F