CMPUT-201 Midterm Exam, Winter 2006, Group A

Student Id: _____

Instructions:

- This is a "closed book" exam.
- No conversations, please. Cheating is lame and may have unpleasant consequences.
- Print your student id on this page and your name and student id on all subsequent pages.
- Write your answers legibly in the space below or next to the questions. Use a pen. No other sheets are accepted.
- You may use the back of the sheets as scratch space.
- Skip questions you cannot answer immediately and return to them later.
- Important: I won't answer any questions regarding this exam. If unsure, state your assumptions clearly.

Good Luck!

Name: Id:

1:	2:	3:	4:
5:	6:	7:	8:

$\sum =$ /47

1. How many bytes in memory do the following variables occupy on a machine with 32–bit memory addresses and 4-byte ints? (6 marks)

A) `const double *x;`

B) `bool x[1000];`

C) `int x[20][30];`

D) `struct Point { int x,y; } x[8];`

E) `char *argv[10];`

F) `union Foo { double a,b,c; int d; } x;`

2. What are the decimal values of integer variable `y` after the following assignments have been executed (`int a=b=c=23`): (6 marks)

A) `y = a ^ a;`

B) `y = a & 0xff;`

C) `y = a >> (a & 3);`

D) `y = a & (a-1);`

E) `y = b *= 3;`

F) `y = *&++c;`

3. The following function is supposed to convert all upper–case letters in a given string into lower–case letters. Correct all syntactic and semantic errors using a minimal number of changes. Recall that C-strings are terminated by a 0-byte. (4 marks)

```
void to_lower_case(const char *s)
{
  for (i=1; s[i] = 0; ++i) {

    if (s[i] >= "a" || s[i] <= "z")

      s[i] = s[i] + "a" - "A";
  }
}
```

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4. Complete the following makefile that creates an unoptimized executable foo from foo.c which includes foo.h, Compiler warnings must be turned on. Also add phony target `submit` whose commands archive foo.h and foo.c into foo.tar and submit it via `astep -c c201 -p asn13 files.tar` (4 marks)

```
CC     := g++
CCOPTS :=

foo:
```

5. What is the text generated by the C preprocessor when processing the following input?(4 marks)

```
#define FOR(i,n) for (int i=0; i < (n); ++i)
#define MAX(x,y) ((x)>(y)?(x):(y))
#define X(a) (a).x

FOR (j, N*M) X(a[j]) = MAX(X(a[j]),X(b[j])); // compute vector maximum
```

6. Give UNIX commands for the following tasks: (6 marks)

A) Create directories `foo1,foo2,foo3`

B) Copy a directory `foo` into directory `~/backup`

C) List all files with access permissions in the current directory

D) Display location of C++ header file `iostream`

E) Count the number of unique lines in file `foo`

F) Display information about the CPU(s) on a Linux system

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7. Write a function that rotates an `unsigned int x` (occupying 32 bits) `k` bits to the right. Rotation means that — unlike regular shift operations — bits that are shifted out reappear at the other end of the sequence (see example below). (6 marks)

```
void rotate_right(unsigned int &x, int k)
{
  assert(k >= 0 && k < 32);
  assert(sizeof(x) == 4);









}

// Example:

unsigned int x = 5; rotate_right(x, 2); // x now 0x40000001
```

8. Indicate by circling T or F, whether the following statements are true or false. (11 marks)
[**Important!** One mark for each correct answer; two wrong answers are free; one mark is deducted for any additional wrong answer; not answering is an option resulting in 0 marks for that question; mark total ≥ 0]

A) The linker reports missing function definitions	T	F
B) Local function parameters are stored on the heap	T	F
C) Floating point arithmetic is accurate	T	F
D) Assigning 32–bit integers to double variables may lose information	T	F
E) Integer overflows cause program termination	T	F
F) When passed to functions, C–arrays do not carry length information	T	F
G) Local variables in C are automatically initialized	T	F
H) Macro expansion can be unsafe because of unwanted additional side effects	T	F
I) Makefile variables are expanded recursively	T	F
J) The preprocessor does not know anything about C types	T	F
K) Arrays are passed by reference	T	F