NAME: _____

Fall 2015 - CMPSC311 - Systems Programming

Professor McDaniel — Monday, September 28th, 2015

Please read the instructions and questions carefully. You will be graded for clarity and correctness. You have 50 minutes to complete this exam, so focus on those questions whose subject matter you know well. This is a closed book and note exam. *Write legibly* and carefully check your answers before handing in the completed exam.

Short Answer - some will be one or two words – no more than 1 sentence. (40/100 points)

1. (*5pts*) When not in insert mode, which keystrokes do you use to save the current file and quit?

2. (*5pts*) What mode are CPU's operating in when user-space programs are running?

3. (*5pts*) What kinds of files contain relocatable machine code generated by a compiler?

4. (*5pts*) What is a suffix rule?

5. (*5pts*) What is the difference between passing by value and passing by reference?

6. (*5pts*) What two things discussed in class are human brain's best at?

7. (*5pts*) Name three non-Linux based versions of UNIX.

8. (*5pts*) What command would you use to extract the contents of the file `exam_data.tgz`?

Long Answer - no more than 4 sentences (20/100 points)

9. (*10pts*) Why do kernel modules generally perform better than user-space device drivers?

10. (*10pts*) Name and define five sections of the process space.

Programming/Word Problems - answer clearly and completely. (40/100 points)

```
#define EX1A "Lo"
#if 1
#define EX1B "Do"
#else
#define EX1B "Mo"
#undef EX1A
#endif
#ifdef EX1A
#undef EX1B
#define EX1B "So"
#ifndef EX1A
#define EX1C "Fo"
#else
#define EX1C "Po"
#endif
#endif
#if 0
#undef EX1C
#define EX1C "Xo"
#endif
```

11. (*10pts*) Consider the following compiler directives above. Identify which of the following symbols are defined when the code is finished compiling. For those that are defined, identify their values.

Symbol	Defined?	Value (if defined)
EX1A		
EX1B		
EX1C		

12. (*10pts*) Identify 10 integer types (used to declare different kinds of integers).

(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)
(i)
(j)

13. (*10pts*) Suppose you have the following C statements on a 32-bit little endian machine,

```
unsigned int x = 789456123;
unsigned int y = 123456789;
unsigned int z = x&y;
```

and that `x`, `y`, and `z` are contiguously located in order in memory starting at address `0x1000`. Complete the following table with addresses and values (SHOW YOUR WORK).

Address	**Value (hex)**
0x1000	

14. (*10pts*) Consider the following variable declarations, and provide statements to print them out, as described (without causing compiler warnings or errors):

```
int i = 8;
unsigned int j = 34;
float f = 3.14349348;
char *s = "This is good";
```

(a) Use one statement to print `i` to standard out.

(b) Use one statement to print `i` to standard out in hexadecimal.

(c) Use one statement to print `j` to standard out.

(d) Use one statement to print `f` to standard out with only the first two decimal places.

(e) Use one statement to print `s` to standard out, right justificed to twenty spaces.