CSC 209H5 S 2014 Midterm
Duration — 50 minutes
Aids allowed: none

Student Number: ⌞__⌟__⌞__⌟__⌞__⌟__⌞__⌟__⌞__⌟__⌞__⌟__⌞__⌟__⌟

Last Name: _____

First Name: _____

Lecture Section: 1   **Instructor: Daniel Zingaro**

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*Do **not** turn this page until you have received the signal to start.*
(Please fill out the identification section above, **write your name on the back of the test**, and read the instructions below.)
Good Luck!

This midterm consists of 4 questions on 10 pages (including this one). *When you receive the signal to start, please make sure that your copy is complete.* If you use any space for rough work, indicate clearly what you want marked.

1: _____/ 6

2: _____/ 4

3: _____/ 6

4: _____/ 4

TOTAL: _____/20

Question 1.   [6 marks]

For each code snippet, do one of two things:

- If the code runs and is well-defined, give its output.

- Otherwise, carefully explain the problem and then add code to fix the problem. You must not modify or reorder the existing code in any way. Give the new code and tell us exactly where to add it.

Part (a)   [2 marks]

```c
#include <stdio.h>

void init(int *p) {
  *p = 99;
}

int main(void) {
  int *value;
  init(value);
  printf("%d\n", *value);
  return 0;
}
```

Part (b)   [2 marks]

```c
#include <stdio.h>
#include <string.h>

int main(void) {
  char s[20];
  s[0] = '\0';
  s[1] = 'a';
  s[2] = 'b';
  printf("%d\n", strlen(s));
  return 0;
}
```

Part (c) [2 MARKS]

```c
#include <stdio.h>
#include <string.h>
#include <stdlib.h>

struct junk {
  int num;
  char *info;
};

int main(void) {
  struct junk *j = malloc(sizeof(struct junk));
  // assume malloc'd succeeds
  j->num = 4;
  j->info = "hello";
  printf("%d %s\n", j->num, j->info);
  return 0;
}
```

Question 2.　　[4 MARKS]

Here is code very similar to code from one of your labs.

```c
int process(unsigned int x) {
  x ^= x >> 8;
  x ^= x >> 4;
  x ^= x >> 2;
  x ^= x >> 1;
  return x; // was return !x in your lab
}

int main(void) {
  unsigned int val = 0b11011000;
  printf("%s\n", to_binary(process(val)));
  return 0;
}
```

Assume `to_binary` is available and that it works as it did in A1 and your bits lab. What is the output of the above code? Show your work at each step.

Question 3.   [6 MARKS]

s consists of zero or more words with exactly one space between each pair of words. Write function `first_letters` that returns a new string that contains the first character of each word in s. There is a sample call below the function.

You must `malloc` exactly the right amount of memory for the resulting string. Since you don't know in advance how much memory to `malloc`, traverse s twice.

```c
char *first_letters(char *s) {
```

```c
int main(void) {
  char *s = "nothing ventured nothing gained";
  char *t = first_letters(s);
  printf("%s\n", t); // prints nvng
  return 0;
}
```

Question 4.   [4 marks]

Part (a)   [2 marks] There are several reasons why a `fork` or `exec` system call might fail. Give (1) one reason why `fork` could fail, and (2) one reason why `exec` could fail. Do not mention the same type of failure twice!

Part (b)   [2 marks] Process A issues an `exit` system call, and **then** process B does a `waitpid` on A. Does the `waitpid` fail? Explain why or why not.

C function prototypes

```
int printf(const char *format, ...)

char *strchr(const char *s, int c) //Search from left
char *strrchr(const char *s, int c) //Search from right
char *strstr(const char *s1, const char *s2) //Search for s2

size_t strlen(const char *s)
char *strncat(char *dest, const char *src, size_t n)
int strncmp(const char *s1, const char *s2, size_t n)
char *strncpy(char *dest, const char *src, size_t n)
```

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Last Name: _____   **First Name:** _____