CISC 105 Spring 2005 Final Exam 5/25/05

Name _____ Section ____ TA _____

General Instructions

- DO NOT WRITE YOUR NAME ON ANY PAGE EXCEPT THIS ONE!
- You have two hours. **Pace yourself,** and pay attention to the point values.
- The exam is 54% multiple choice, and 46% programming and short answer. The remainder is essay.

  The programming/short answer questions start with number 21.
- Do problems you are confident about first. If you finish the problems you know, write what you do know about other problems to gain partial credit; but erroneous information may detract from that credit or irritate the grader, so don't make stuff up.
- Read *all* the directions *carefully* on each problem.
- Often writing a fast, rough version of a program in English or pseudocode will make your C coding faster and more accurate. It also enables me to give partial credit in some circumstances.
- You may assume that input will not produce errors for the procedures described, unless the question says otherwise.
- Do not do unnecessary testing. For example, testing for both `x < 0` and `x >= 0` instead of using one test and then `else` would be considered unnecessary testing.
- Good luck!

Multiple Choice: Mark answers on Scantron form in #2 pencil

Strings

1. (3 pts) Which of the following is a correct way to change c after the code shown?

```
int main(){
    char c;
    ...
```

(a) `c = "s";`
(b) `c = 's';`
(c) `strcpy(c, "s");`
(d) `c = strcpy(c, "s");`
(e) none of the above

Answer the following questions based on a two-dimensional array of characters called `words` as follows:

char words[20][20] = "I", "grok", "the", "C", "language";

2. (3 pts) Which of the following correctly prints the word "grok"?

(a) `printf("%c", words[1]);`
(b) `printf("%s", words[2]);`
(c) `printf("%s", words[1]);`
(d) `puts(word, 10, stdout);`
(e) none of these

3. (3 pts) Which of the following statements changes the letter "h" in "the"?

(a) `strcpy(words[3][1], "A");`
(b) `strcpy(words[2][1], "A");`
(c) `words[2][1] = 'A';`
(d) `char words[3][2] = 'A';`
(e) none of these

4. (3 pts) Which of the following changes the word "grok" to "love"?

(d) `strcpy(words[2][0], "love");`
(a) `strcpy("grok", "love");`
(b) `strcmp(words[2][0], "love");`
(c) `strcmp(words[2], "love");`
(e) none of these

5. (3 pts) Suppose you are to write a function like `strcmp`. Which of the following might be used as a prototype for that function?

   (a) `int myStrCmp(char a[], char b[]);`
   (b) `void myStrcmp(string a, string b);`
   (c) `int myStrcmp(string a, string b);`
   (d) `void myStrcmp(char a[], const char *b);`
   (e) none of the above

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6. (3 pts) Selection sort works in a series of passes over an array. Choose the answer that shows how this array will appear after the first TWO passes of selection sort (as discussed in class).

   original array: [5 2 8 4 1 3 7 9]

   (a) 8 9 5 2 7 4 1 3
   (b) 5 2 7 4 1 3 8 9
   (c) 5 8 4 3 7 9 1 2
   (d) 2 4 1 3 5 7 8 9
   (e) none of the above

7. (3 pts) How many comparisons will binary search be expected to perform to find one member of a list of 1000 sorted numbers?

   (a) 999
   (b) approximately 20
   (c) approximately 30
   (d) approximately 40
   (e) approximately 500

8. (3 pts) The heap is:

   (a) another name for the stack
   (b) specially allocated memory on the hard drive
   (c) a place for dynamically allocated memory
   (d) a place for sorted char array storage
   (e) where malloc writes data to

9. (3 pts) As discussed in class, what significant advantage does a struct have over an array?

   (a) members can have different types
   (b) structs are allocated on the heap
   (c) structs have persistent reference
   (d) structs do not require for loops
   (e) none of the above

10. (3 pts) When structs are passed as parameters, they behave as

    (a) pass by reference

    (b) pass by value

    (c) pass by name

    (d) pass by assignment

    (e) none of the above

11. (3 pts) Which of the following function prototypes represents a function that can modify the contents of an integer array called data in main()?

    (a) void f(int data);

    (b) int f(int data[]);

    (c) void f(int *data);

    (d) int f(int *data[]);

    (e) none of the above

12. (3 pts) Which of the following function prototypes represents a function that can modify the contents of a ”struct truck” called data in main()?

    (a) void f(struct truck data);

    (b) int f(struct truck data[]);

    (c) void f(struct truck *data);

    (d) int f(struct truck *data[]);

    (e) none of the above

13. (2 pts) Which of the following would be a correct way to begin a main() that accepts command line arguments?

    (a) `int main(int argc, char argv[]){`

    (b) `int main(int argc, char *argv){`

    (c) `int main(int argc, char **pointers[]){`

    (d) `int main(int count, char *input[]){`

    (e) none of the above

Pointers

name	address
x	A0
y	A4

```
int x = 3;
int y = 4;
int *p1, *p2;
```

14. (2 pts) To make `p1` point to `x`, use:

    (a) `p1 == &x;` (b) `p1 = *x;` (c) `p1 = &x;` (d) `p1 = "A0";` (e) error

15. (2 pts) Assume p1 points to `x`. To add five to `x`, use:

    (a) `p1 += 5;` (b) `*x += 5;` (c) `&p1 = *p1 + 5;` (d) `x = *p1 + 5;` (e) error

16. (2 pts) Assume p1 points to `x`. To make p2 point to `x`, use:

    (a) `p2 = p1;` (b) `p2 = *x;` (c) `p2 = &y;` (d) `*p2 = &x;` (e) error

17. (2 pts) Assume p1 points to `x`. To print the address of `x`, use:

    (a) `printf("%p", *x);`
    (b) `printf("%d", p1);`
    (c) `printf("%d", &x);`
    (d) `printf("%p", &p1);`
    (e) none of the above

Numeric Questions

Listed below are a series of code fragments. Assume that each of these appears in a complete C program, and that all necessary libraries have been included.

Your task: if the code fragment has no errors, select the answer that corresponds to the value of `x`. If the code fragment won't compile or will produce a run-time error, choose the answer "error". Each of the fragments is unrelated to the others; that is, "start from scratch with each question".

18. (2 pts)

```
float x = 8 % 5;
```

(a) 3.0 (b) 40.0 (c) 1.0 (d) 2.0 (e) error

19. (2 pts)

```
int x,y;
y = 8/3;
x = x % y;
```

(a) 3 (b) 0 (c) 1 (d) 2 (e) error

20. (2 pts)

```
float x = 16 / 5;
```

(a) 3.0 (b) 3.2 (c) 1.0 (d) 2.0 (e) error

21. (2 pts)

```
int x=0, y=0;
while( x < 100 )
    y++;
```

(a) 99 (b) 100 (c) 101 (d) 200 (e) error

Programming

22. (12 pts) Write a function “swap”. The function, called from main(), will exchange the values held in two integer variables in main() (i.e. it will swap the values). **Only** write the function.

23. (10 pts) Given this partial main, complete it:

    (a) Correct any errors in the code shown.

    (b) Have newWord point to exactly the amount of space needed by the word in temp.

    (c) Put the word from temp into newWord.

    (d) Print the contents of newWord.

```
int main(){

    char * newWord;
    char temp[30];
    printf("Enter a word: ");
    scanf("%s", temp);
```

```
/*
 * Binary Search
 * Parameter a is a sorted array.
 * Parameters low and high start as end indices of array a.
 * Returns a positive array index, or -1 if key is not found.
 */
int binarySearch(int a[], int key, int low, int high){
    int mid;

    /*MISSING CODE HERE*/

    if (a[mid] > key)
return binarySearch(a, key, low, mid - 1);
    else if (a[mid] < key)
return binarySearch(a, key, mid + 1, high);
    else return mid;
}
```

24. (12 pts) **Below this line**, write the code that is missing from the binary search function above. Do not change the code shown.

25. (12 pts) Write a function **strcat** that takes two “strings” as parameters, concatenates them into the first parameter and returns a pointer to the first parameter. So if you passed strcat the parameters “cat” and “dog” it would return a pointer to “catdog”. **Do not** call other string handling functions. **Only** write the function.

    Hints: Traverse the first string using an index variable, stopping at the end. Now use a second index variable to traverse the second string, copying it behind the characters of the first string, and keeping track of two index variables. Draw yourself a picture.