Midterm Exam

Fundamentals of Computer Science in C

Fall 2002

Name: ____________________

Rules

• **NO GROUP EFFORTS!**
• Closed books, closed notes, no calculators, no “cheat sheets”
• No class reentry (if you leave, you cannot come back)
• Follow directions carefully
• Circle the letter of your choice on multiple choice questions
• Try to write your answers in the boxes found below of each problem
• Use the back sides of pages for scrap work
• Comments are unnecessary, and programming style is of negligible importance
• Please print (not a rule, just a suggestion)

Good Luck!
1. Multiple Choice Questions (20 points)

1. Which one of the following kinds of values does not have a corresponding primitive ("built-in") data type in the C programming language?

   (a) integers
   (b) floating point numbers
   (c) single characters
   (d) character strings

2. To selectively execute exactly one of five alternative statements with chain of if/else statements, how many test expressions are needed?

   (a) 3
   (b) 4
   (c) 5
   (d) 6

3. By default, C statements are executed, from top to bottom, in the order they appear in the program. What is this default control structure called?

   (a) conditional
   (b) function call/return
   (c) repetitive
   (d) sequential

4. What is the special value entered by a program user to indicate "no more data" called?

   (a) a counter
   (b) a loop
   (c) a sentinel
   (d) a total

5. Suppose the return type of function *f* is void. Which one of the following statements is true?

   (a) function *f* does not contain a return statement
   (b) function *f* does not have parameters
   (c) function *f* does not return a value
   (d) function *f* does not work correctly
2 Determine the Output (25 points)

Determine the output produced by each of the following for loop statements:

1. for (i = 0; i < 10; ++i)
   printf("*");

```
*********
```

2. for (i = 0; i < 10; ++i)
   printf("%d", i);

```
0123456789
```

3. for (i = 0; i < 10; ++i)
   if ((3 < i) && (i <= 6))
      printf("A");
   else
      printf("B");

```
BBBBAAABBB
```

4. for (i = 0; i < 10; ++i)
   if ((i % 2) == 0)
      printf("A");
   else if ((i % 3) == 0)
      printf("B");
   else
      printf("C");

```
ACABACACACAB
```
5. for (i = 0; i < 6; ++i) {
    for (j = 0; j < 4; ++j)
        printf("\n");
    printf("\n");
}

6. for (i = 0; i < 5; ++i) {
    for (j = 0; j < i; ++j)
        printf("\n");
    printf("\n");
3 Fix the Errors (25 points)

The following program compiles without error, but does not produce the desired results when it is executed. It contains multiple logical errors. Fix the errors. (It is not necessary to rewrite the entire code – simply indicate your modifications on the original code.)

/* Average.c
 * ========
 * This program scans in the scores of 100 students, some undergraduate,
 * some graduate. The average grade achieved by each group, accurate
 * to three digits to the right of the decimal point, is printed. */

#include <stdio.h>

int main()
{
    int i; /* loop counter */
    int type, score; /* inputs */
    int undergradTotal = 0; /* sum of all scores of undergraduates */
    int gradTotal; /* sum of all scores of graduate students */
    int undergradCount = 0; /* number of undergraduates */
    int gradCount = 0; /* number of graduate students */

    for (i = 0; i < 100; ++i) {
        /* obtain inputs */
        printf("Enter student type (1 - undergrad, any other number - grad): ");
        scanf("%d", &type);
        printf("Enter the students score: ");
        scanf("%d", &score);

        /* update the appropriate total/counter combination */
        if (type == 1) {
            undergradTotal += score;
            ++undergradCount;
        } else {
            gradTotal += score;
            ++gradCount;
        }
    }

    /* produce output */
    if (undergradCount > 0)
        printf("Undergraduate Average: %.3f\n", (double) undergradTotal / undergradCount);
    if (gradCount > 0)
        printf("Graduate Average: %.3f\n", (double) gradTotal / gradCount);

    return 0;
}
In this problem, you will write a complete program very similar to your second programming assignment; once again it deals with a sporting event.

Exactly **eight** sprinters run a 100 meters race. Your program must prompt the user to enter the id number and time of each of the eight racers. Your program must determine *both* the winner of the race (the runner with the _minimum_ time), *and* the second place finisher. (You do _not_ have to calculate the average time.)

You may make the following assumptions: (i) there are no ties; and (ii) each time entered is positive, and is less than 20 seconds.

```c
#include <stdio.h>

int main()
{
    int i;
    double time, firstTime = 20., secondTime = 20.;
    int id, firstId, secondId;

    for (i = 0; i < 8; ++i) {
        /* obtain inputs */
        printf("Enter racer number: ");
        scanf("%d", &id);
        printf("Enter time for racer %d: ", id);
        scanf("%lf", &time);

        /* update leaderboard */
        if (time < firstTime) {
            secondId = firstId;
            secondTime = firstTime;
            firstId = id;
            firstTime = time;
        } else if (time < secondTime) {
            secondId = id;
            firstTime = time;
        }
    }

    /* produce output */
    printf("\nFirst Place: racer number %d, time %g\n", firstId, firstTime, secondId, secondTime);

    return 0;
}
```