**Practice Final Exam** December 10, 2002
CMSC 104, Section 0801 Problem Solving and Introduction to Programming

Read and follow all of the instruction that are provided on the exam. Each section has detailed instructions on how to solve the problems and descriptions of what various symbols mean in the context of that specific section.

## NUMBER SYSTEMS

1. Each row in the following table has three equivalent values represented in each of the three number systems. Fill in the blanks with the appropriate number system representation. The first row is completed as an example.

| | Binary | Decimal | Hexadecimal | Septimal (base 7) |
|---|---|---|---|---|
| a. | 00010111 | 23 | 17 | 00032 |
| b. | 10011001 | | | |
| c. | | 242 | | |
| d. | | | cd | |
| e. | | | | 00166 |

## SHORT ANSWER (30 POINTS)

Answer each of the following question as accurately and as briefly as possible.

2. Name four of the six major components of a computer.

3. Define the term **algorithm**.

4. Given the pseudocode below, what is the exact output if a user inputs the value of 5.

```
Print ''Enter height''
Read <height>
<hcount> ← 0
while ( <hcount> is less than <height> )
    <wcount> ← 0
    while ( <wcount> is less than <height> - <hcount> )
         Print ''   ''
         <wcount> ← <wcount> + 1
    end while
    while ( <wcount> is less than <height> )
         Print <wcount>
         <wcount> ← <wcount> + 1
    end while
    Print ''\ n''
    h<count> ← <hcount> + 1
end while
```

5. Give a pseudocode version of an algorithm that will print “Hello, World!” a number of times specified by the user. As an example, the program would print the following, given the input of 3:

```
Hello, World!
Hello, World!
Hello, World!
```

6. State whether the following English sentences are syntactically correct, semantically correct, both, or neither.

a. Winter is my favorite day of the year.

b. Day winter yes month, yes – yes, I like to winter.

c. Pass me the Christmas cookies.

## C Programming

The following questions relate to C Programming. Answer in the space provided..

7. What are the exact results of executing:

a.
```
printf(''World\tHello\nHello\tWorld\n'');
```

b.
```
int g;
for (g = 0; g < 3; ++g)
    printf("%d \t",g*g);
```

c.
```
double ma[10] = {0.0,1.0,2.0,3.0,4.0,5.0,6.0,7.0,64.0,81.0};
printf('' %2.01f \n'', ma[8]);
printf('' %.21f \n'', ma[2]);
```

8. Circle the **valid** C variable names:

| | | | |
|---|---|---|---|
| undo | d-day | SaNtAClAUS | 25dec |
| *%*%*%*%*%* | helloworld | double | doubles |
| alpha | bee-hive | [grover] | robin_hood |

9. Write a code **fragment** that declares an array of length 1000 and uses a **for** `loop to initialize the array to all zeros.`

10. Write a function prototype for a function that calculates the average value of an set of numbers that are stored in one array. The array and its size must be the input.

11. Give a function definition for bubble sort.

## ARITHMETIC OPERATORS

12. For each entry in the table, evaluate the resulting value of v. For **each** instruction in the table, the starting values are a = 3, b = 9, c = 27. The first row is given as an example. (Hint: Pay attention to the order of operations!)

| Instruction | v |
|---|---|
| `v = b * b % a % c;` | |
| `v = a * (2 + b) / c;` | |
| `v = (a * b % a) * c * c;` | |
| `v = (a + 2) / (b + 4) * (3 * c / b);` | |
| `v = c % c * (a * b * c * 27);` | |

## LOGICAL OPERATORS AND TRUTH TABLES (10 POINTS)

13. Fill in the table below with the truth values (0 - **FALSE**, 1 - **TRUE**) for the complex condition. The values for the variables are given. The first line is filled in as an example.

| a | b | c | `(a \|\| !b) \|\| (c && !a))` |
|---|---|---|---|
| 0 | 1 | 0 | |
| 1 | 0 | 1 | |
| 1 | 0 | 1 | |
| 1 | 1 | 0 | |
| 0 | 0 | 1 | |
| 1 | 1 | 1 | |

14. Fill in the table below with the truth values (0 - **FALSE**, 1 - **TRUE**) for the complex condition. The values for the variables are given. The first line is filled in as an example.

| a | b | c | !(c == b) \|\| (a && (c > a) && (c > b)) |
|---|---|---|---|
| 0 | 1 | 3 | 1 |
| 0 | 0 | 4 | |
| 1 | 6 | 7 | |
| 1 | 3 | 1 | |
| 0 | 0 | 0 | |
| 1 | 22 | 22 | |

## ASSIGNMENT OPERATORS

11. For each entry in the table, evaluate the resulting value of a, b, c, and v. For **each** instruction in the table, the starting values are a = 2, b = 3, c = 7, and v = 0. The first row is given as an example. (Hint: Pay attention to the order of operations!)

| Instruction | a | b | c | v |
|---|---|---|---|---|
| v = a++ + ++b + --c; | | | | |
| v = a = c += b; | | | | |
| v += --a / c++ * --b; | | | | |
| v -= c * 3 - --b % a++; | | | | |
| v += b = a *= c + v; | | | | |

You should also know all of the following:

- basic linux commands
- the three types of control sequences
- the syntax of C programs (including: printf, scanf, getchar, while-loops, for-loops, conditional statements, preprocessor directives, rand(), atoi, switch, float, double, int, char, arrays, etc.)
- searching and sorting as covered in the notes
- functions definitions, prototypes, and calls
- anything else we covered throughout the semester.