

Exam I Review Questions

Fall 2010

The following review questions are similar to the kinds of questions you will be expected to answer on Exam I (scheduled for Oct. 14), which will cover LCR, chs. 1–7, and TCS, chs. 1–9. **Make sure you do your best to answer each question before you look at the Key**; that will help you to learn. If you have any questions about the answers, please ask them in class or ask your Teaching Assistants in the review session. The actual exam will be about 16 questions.

1. (4 points)

Please answer the following questions.

- a. What `#include` statement do you put at the top of a program that does uses `cin` or `cout`?
- b. What `using` statement do you always put at the top of your programs?
- c. Declare an integer variable `N` and initialize it to 10.
- d. Give a statement to increase the value of variable `N` by 10.
- e. What library would you include if you wanted to use the `sin`, `cos`, and `tan` functions?
- f. What library would you include if you wanted to do file input/output?
- g. What library would you include if you wanted to use vectors?
- h. What library would you include if you wanted to use pseudo-random numbers?

2. (5 points)

Complete the code segment below to print “There are *XXX* days.” if integer `x` has a value 1 through 7 inclusive. Replace *XXX* with the value of variable `x`; note the period.

```
int x;
cin >> x;
// add your code here
```

3. (6 points)

What is the final value of each expression? Watch for integer division.

- a. $12 + 6.8 / 2$
- b. $15 / 6.0 + 2$

c. `(int)30.55 / 4; // casting has precedence over division`

4. (4 points)

You have an integer variable `x` that holds a four-digit positive integer. Write C++ code to store the middle two digits in integer variable `y`.

5. (10 points)

What is the output from each code segment below?

```
a. int x = 1, y = 0;
   if (x > 0 && y < 0) {
       x = y = 23;
   }
   cout << x << " " << y << endl;
```

```
b. int x = 1, y = 0;
   if (x > 0 || y < 0) {
       x = y = 23;
   }
   cout << x << " " << y << endl;
```

```
c. x = 10; y = 40;
   if (x >= 10) {
       if (y < 40) {
           y++;
       } else {
           y--;
       }
   }
   cout << x << " " << y << endl;
```

```
d. x = 10; y = 40;
   if (x >= 10) {
       if (y < 40) {
           y++;
       }
   } else {
       y--;
   }
   cout << x << " " << y << endl;
```

e. In part d above, under what condition(s) would `y` be incremented?

6. (6 points)

How many times does each loop execute?

```
a. for (i = 0; i <= 100; i++) {  
    robot.translate(1);  
}
```

```
b. for (i = 1; i < 100; i++) {  
    robot.translate(1);  
}
```

7. (6 points)

Examine the code below. What (not how) does the following function do?

```
int mystery(int x, int y, int z)  
{  
    int temp;    // ultimately, holds returned value  
  
    temp = x;    // assume the largest is x  
    if(y > temp) { temp = y; }  
    if(z > temp) { temp = z; }  
    return temp;  
}
```

8. (8 points)

The Fibonacci numbers are defined:

```
fibonacci(0) = 1  
fibonacci(1) = 1  
fibonacci(n) = fibonacci(n-1) + fibonacci(n-2);
```

Write a *recursive* C++ function to compute the Fibonacci numbers:

9. (4 points)

What is printed in each case:

```
a) cout << 3 * 4+5 << endl;
```

```
b) cout << 17 + 10 / 4 << endl;
```

```
c) string N = "17";
   cout << N + "10 / 4" << endl;
```

```
d) int N = 17;
   cout << (N = 16) << endl;
```

10. (6 points)

Suppose that every time `currentTime()` is called, it returns the current time in the form of an integer (typically the number of seconds since a certain day in 1970). Using `currentTime()` and `motors()`, write C++ code to make the robot move forward at half speed for 45 seconds.

11. (9 points)

Study the following code segment.

```
int N = 7;
int i, x;

for (i = 1; i <= N; i++) {
    cin >> x;
    cout << i << ". " << x << " ";
    if(i % 3 == 0) { cout << endl; }
}
cout << endl;
```

a. What is displayed with the given input? Watch the `endl` characters.

Input: 11 12 13 14 15 16 17 18 19

b. In terms of `N`, what is the value of the loop control variable upon termination?

12. (4 points)

1. Rewrite the following C++ statement to make it more robust (less prone to error).

```
if (x / y != 0 && y != 0) { cout << x / y << endl; }
```

2. Rewrite the following C++ code segment to make it more efficient and to remove any unnecessary code.

```
if (x < y && y > x) { cout << "Not good.\n"; }
cout << "Carry on.\n";
```

3. Rewrite the following C++ code segment to make it more efficient and to remove any unnecessary code.

```
if (x < y && y >= x) { cout << "Not good.\n"; }
cout << "Carry on.\n";
```

4. Rewrite the following C++ code segment to make it more efficient and to remove any unnecessary code.

```
if (x < y || y >= x) { cout << "Not good.\n"; }
cout << "Carry on.\n";
```

13. (4 points)

If A and B are boolean variables, then the expression `(!A) || (!B)` is equivalent to which of the following conditions:

- a) `(! (A && B))`
- b) `(! (A || B))`
- c) `(!A) && (!B)`
- d) `true`

14. (5 points)

Complete the function `sorted()` that returns `true` if two `double` vectors are sorted in ascending order, and `false` otherwise. Declare any variables that you need. To get full credit, your function must have a single exit point.

15. (5 points)

Write a C++ `main()` function that reads `double` numbers from a file called `"in.dat"` until it reaches the end-of-file, and prints the numbers on `cout` left-justified in a field of width 6 with three digits after the decimal point. Your program should not use vectors or arrays (which it does not need). Make sure to show any required `#includes`.

16. (5 points)

Given the following definition of `Date`, which represents a calendar date, write a `void` function `nextYear()` that adds one to the year member variable of its argument:

```
struct Date {int month, day, year; };
```

17. (5 points)

Describe in words and show in a diagram (you must do both to get full credit) how you would wire up a Braitenberg vehicle so that it exhibits the following behavior:

The vehicle accelerates towards light directly in front of it, but tends to veer away from light that is on one side or the other of it.

18. (5 points)

Write an `int` function `firstNB (string S)` that returns the index of the first nonblank character in `S`. If `S` does not have any nonblank characters, then your function should return the length of `S`.

19. (5 points)

State in your own words the difference between *reactive (or direct) control* and *behavior-based control*.

20. (5 points)

For the following questions, tell (1) what the function does with the argument, (2) what can be done to the argument within the function, and (3) how the original argument is affected by the action of the function.

- (a) When an argument is passed by **value** to a function [e.g., `f (int v)`], what happens?
- (b) When a **reference variable** is passed to a function [e.g., `f (int& v)`], what happens?
- (c) When a **constant reference** variable is passed to a function [e.g., `f (const int& v)`], what happens?

21. (5 points)

Explain the difference between an *interoceptors* and an *exteroceptors*? Give an example of each.