

COMP-2355, Winter 2012
Midterm Exam
February 6, 2012

**READ ALL INSTRUCTIONS
BEFORE TAKING THIS EXAM!**

*This midterm is worth 20% of your course grade. Be careful to **read all instructions** for the exam before you begin. A small number of points will be deducted for not following instructions correctly.*

The exam should be written in black or blue ink. All answers should be written inside the exam booklet. No other materials are allowed during the exam. If you are unsure what a question is asking, write your assumptions. If there are more general clarifications, ask the proctor of the exam.

Write your name and SID on every page of the exam.

This exam should be entirely your own work. Students caught cheating may receive a 0 on the midterm and/or be subject to academic discipline. Additionally, it is your responsibility to make sure that other students cannot copy your work.

Part 1	_____	[of 10]
Part 2	_____	[of 10]
Part 3	_____	[of 10]
Part 4	_____	[of 15]
Part 5	_____	[of 15]
Part 6	_____	[of 15]
Part 7	_____	[of 25]
Total	_____	[of 100]
Bonus	_____	

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1. Initializing variables:

a) Write code to declare a string and initialize it to the text `hello world`.

b) Write code to declare a character and initialize it to the letter `a`.

c) Suppose the class `Foo` has been defined. Write the code to declare a `Foo` object on the stack.

d) Suppose the class `Foo` has been defined. Write the code to declare a `Foo` object on the heap.

e) Write code to declare and initialize an integer array with the numbers `3, 1` and `4`.

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2. What are the primitive (built-in) types in C++?

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3. Code

Write code which takes in two `uint32_t`'s and returns true if any of the bits inside the values are identical. That is, if the n th bit is set in both variables, for at least one n in $0 \dots 31$, return true. Otherwise return false.

```
bool ContainSharedBits(uint32_t a, uint32_t b)
{
```

```
}
```

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4. Code

Following is the definition for a bubble sort. Fill in the arguments for the swap function call in the code, and write the swap function to match your function call.

```
void BubbleSort(int *array, int theSize)
{
    for (int x = 0; x < theSize; x++)
    {
        for (int y = 0; y < theSize-1; y++)
        {
            if (array[y] > array[y+1]) // swap elements at y and y+1
                swap(                );
        }
    }
}

void swap(                )
{

```

```
}
```

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5. Code

Write a function that tests if the sum of values in an array is equal to a passed in sum.

```
bool TestSum(int *values, int count, int sum)
{
```

```
}
```

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6. Code

Write the StringLength function which returns the length of a string. Do not use the library function strlen.

```
int StringLength(char *myString)
{
```

```
}
```

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7. Debug Code

A small sample program is found on the following pages, but it has numerous mistakes (more than 10). Find and correct 10 mistakes in the program. Very briefly describe each mistake (one sentence or less).

```
//////////////////// MyList.h //////////////////////
```

```
struct MyList {  
    MyList *next;  
}
```

```
bool IsNextNull(MyList *val) { return val->next == null; }
```

```
void Append(MyList *currList, MyList *newVal)
```

```
void FreeMemory(MyList *theList = 0)
```

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```
//////////////////// MyList.cpp //////////////////////
```

```
void Append(MyList *currList, MyList *newVal)
{
    if (IsNextNull(currList))
    {
        currList->next = newVal;
    }
    else {
        Append(currList->next, newVal);
    }
}
```

```
void FreeMemory(MyList *theList = 0)
{
    if (theList == 0)
    {
        return 0;
    }
    FreeMemory(theList->next);
    delete theList;
}
```

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```
//////////////////////////////// main.cpp //////////////////////////////////
```

```
int main(void)
{
    MyList m = 0;

    MyList *n = 0;

    n = new MyList();

    n->next = new MyList();

    FreeMemory(n);

    n->next = 0;

    FreeMemory(m);

    FreeMemory();
}
```

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8. Bonus Questions (extra credit)

a) [5 points] What does the expressions $(x \& (x-1))$ do? (Hint: the correct answer has nothing to do with subtraction or bitwise 'and'.)

b) [1 point] Finish the sentence: One thing I like about the class so far is:

c) [1 point] Finish the sentence: One way this class could be improved is: