CPSC 1070 – Programming Methodology, Prof. House
Sample Second Midterm Exam, 50 Minutes, Closed Book, Notes

These are example short answer questions. The midterm will have 10 short answer questions, each worth 4 points.

For the first four problems, assume that the following enum and class declarations have been made. The `Toys` class is intended to maintain an inventory of toys in a toy store, using an array. When an object of the class is created, it needs to allocate the `stock` array to be able to handle each type of toy. Each time `addtoy()` is called it should increment the count for that type of toy. Function `getntoys()` returns the total number of all toys in the stock, and `toycount()` returns the count for a particular type of toy or -1 if the toy type is invalid.

```
enum toytype{leggos, matchboxcar, barbie, blocks, potatohead};

class Toys{
private:
  int ntoys;
  int *stock;

public:
  Toys();
  ~Toys();

  void addtoy(toytype kind);

  int getntoys();

  int toycount(toytype t);
};
```

1. Write definitions for the default constructor, and the destructor for the class `Toys`.

2. Write a definition for the method `addtoy()`.

3. Write a definition for the method `toycount()`.

4. You are a programmer writing an application that makes use of the `Toys` class. The programmer who maintains the `Toys` class informs you that he is changing the class so it uses a linked list instead of an array to keep track of the toys. He says the interface will not change. What do you need to do to modify your code to take this change into account?

5. In the following code fragment, what statement would have to be inserted following the `cin` statement to allocate space for the array `boxes` based on the number of boxes that the user inputs.

```
struct Box{
  float xmin, xmax;
  float ymin, ymax;
};
Box *boxes;
int numboxes;

cout << "Enter the number of boxes: ";
cin >> numboxes;
```

6. Complete the parameter declaration for the following C++ function that computes the ratio of two floating point numbers `n1` and `n2`, and returns the ratio as a third parameter named `ratio`. The function value will be true if the ratio is defined and false if the ratio is undefined (i.e. essentially 0 / 0).

```
bool computeratio(                                          ){
  const float eps = 0.000001;
  if(fabs(n1) < eps && fabs(n2) < eps)
    return false;
  else
    ratio = n1 / n2;
  return true;
};
```

7. The following code fragment allocates space for a 2d array called `table` that has `nrows` rows, and `ncols` columns. Write code to fill row 0 with 0's, row 1 with 1's, etc. to the end of the array.

```
float *table;
int nrows, ncols;
. . .
table = new float[nrows * ncols];
```

8. What would the following C code fragment print?

```
char name[12];
strcpy(name, "Forest Gump");
. . .
char *rename = name;
rename[7] = 'B';

printf("%s is now %s\n", name, rename);
```

These are example long answer questions. The midterm will have three long answer questions, each worth 20 points.

9. Complete the following C++ iostream code to read pairs of integer numbers from a file named `numbers.txt` until the end of the file is reached. It should print their sums in the form `6 + 3 = 9`.

```
#include <fstream>
#include <cstdlib>
using namespace std;

ifstream infile;
float f1, f2;
```

10. Assume that you have the point class `Point` available to you. You have the following C++ definition of a stack in the file `Stack.h`. A `Stack` keeps a list of points. Assume that `top` points to the top entry on the stack, which is maintained as a linked list of nodes. Write code to implement the constructor, the destructor, and the `Pop` methods for the `Stack` class (i.e. the code that would be in the corresponding `Stack.cpp` file):

```
#include "Point.h"

struct Node{
  Point pt;
  Node *next;
};

class Stack{
private:
  Node *top;

public:
  Stack();
  ~Stack();

  void Clear();
  bool Empty() const;

  void Push(const Point &newpt);
  Point Pop();
};
```