Midterm Exam
Programming Workshop 2 (CSCI 1061U)
University of Ontario Institute of Technology

March 6, 2018

Total time: 50 minutes

Family name: _________________________________
Given names: _________________________________
Student number: _________________________________

<table>
<thead>
<tr>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>______/2</td>
</tr>
<tr>
<td>2</td>
<td>______/2</td>
</tr>
<tr>
<td>3</td>
<td>______/2</td>
</tr>
<tr>
<td>4</td>
<td>______/2</td>
</tr>
<tr>
<td>5</td>
<td>______/2</td>
</tr>
<tr>
<td>6</td>
<td>______/6</td>
</tr>
<tr>
<td>7</td>
<td>______/6</td>
</tr>
<tr>
<td>8</td>
<td>______/4</td>
</tr>
<tr>
<td>Total</td>
<td>______/26</td>
</tr>
</tbody>
</table>

Instructions

- Please write in pen.
- Be tidy and neat.
- This exam sheet contains a total of 6 pages.
Written Part

Question 1

Fix the function `some_func()` in the following code to produce the output given below.

```cpp
#include <iostream>
using namespace std;

void some_func() // TO DO
{
    int i;
    cout << "This is the " << i << "th call of this function." << endl;
}

int main()
{
    for (int i=0; i<3; ++i) some_func();
    return 0;
}
```

Output

This is the 0th call of this function.
This is the 1th call of this function.
This is the 2th call of this function.

Question 2

Provide the copy constructor for this class

```cpp
class vec2 {
public:
    double x;
    double y;

public:
    vec2(): x(0), y(0) {} // Default constructor
    // TO DO: please provide copy constructor
    ┌───────────────────────────────────────────────────────────────────────────────
    │
    │
    │
    │
    │
    └───────────────────────────────────────────────────────────────────────────────
};
```
Question 3

Explain the difference between 'x' and "x" when used as constants in C++. Describe the memory representation of both values.

Question 4

Circle the bug(s) in the following code.

```cpp
#include <iostream>
using namespace std;

int main()
{
    int a[]=(1,2,3,4,5);
    for (int i=0; i<=5; ++i) {
        cout << "a[" << i << "] = " << a[i] << endl;
    }
    return 0;
}
```
Question 5

Write down the output of the following piece of code.

```cpp
#include <iostream>
using namespace std;

int increment(int n)
{
    return n + 1;
}

int main()
{
    int n=0;
    for (int i=0; i<3; ++i) {
        increment(n);
    }
    cout << "n = " << n << endl;
    return 0;
}
```

Output

```
```

Question 6

You are allowed to use a 1D array `arr` to store an $m \times n$ matrix $M$. This matrix has $m$ rows and $n$ columns. In order to store entries of matrix $M$, array `arr` has $m \times n$ slots. Complete the following function `get(int* arr, int r, int c)` that returns the value stored at row $r$ and column $c$ of the matrix.

```cpp
int get(int* arr, int r, int j)
{
    int val = 0;
    
    return val;
}
```
Question 7

Complete the following code that updates an array to contain its *cumulative sum*. E.g., say an array is 1, 3, 5. Then the array will be modified to 1, 4, 9.

```cpp
#include <iostream>
#include <cstdlib>
using namespace std;

int main()
{
    int a[5];

    for (int i=0; i<5; ++i) a[i] = rand();

    for (__________________________________________;
         _________________________________________;
         _________________________________________)
    {
        _________________________________________
        _________________________________________
    }

    return 0;
}
```

Question 8

Illustrate the content of stack and heap memories at line 20 of the code shown below.

```cpp
#include <iostream>
#include <cstdlib>
using namespace std;

int main()
{
    int a = (rand() / rand());

    int *b = new int;
    *b = 2;

    for (int i=0; i<3; ++i) {
        int c = 2 * i;
        int *d = new int;
        *d = 2*c;
        cout << "c=" << c << " d=" << *d << endl;
    }

    int* c = b;

    delete b;
```
return 0;
};