

SAMPLE Midterm Exam

Sep 20, 2012

NAME:

OPEN BOOK, OPEN NOTES, CALCULATORS ALLOWED.

1. The implementation for the `Matrix` assignment operator given below has four flaws.

What are the four errors?

What are the symptoms of each of the errors?

What changes are needed to the code to fix the errors?

```

1 // Definition of Matrix from matrix.h
2 class Matrix {
3 public:
4     Matrix(); // Default Constructor
5     // Other constructors omitted for brevity
6     Matrix& operator=(const Matrix&); // Assignment operator
7     // Other methods omitted for brevity
8 public:
9     Index_t nCol; // Number columns in matrix
10    Index_t nRow; // Number of rows in matrix
11    Element_t* elements; // Pointer to variable number of elements
12 };
13
14 // Implementation of assignment operator from matrix.cc (buggy)
15 Matrix& Matrix::operator=(const Matrix& rhs)
16 {
17     nCol = rhs.nCol;
18     nRow = rhs.nRow;
19     elements = new Element_t[nCol*nRow]; // Allocate memory for elements
20     // Copy rhs elements
21     for (Index_t i = 0; i <= nCol*nRow; ++i)
22     {
23         elements[i] = rhs.elements[i];
24     }
25     return *this;
26 }

```

Program q3-matrix.cc

2. What is printed by the sample program below.

```
1 // Subroutine Parameter Passing Example
2 #include <iostream>
3
4 int Sub2(int k, int j)
5 {
6     std::cout << "Sub2 k is " << k << std::endl;
7     return j++;
8 }
9
10 int Sub1(int i, int* pI)
11 {
12     *pI++ = 100;
13     std::cout << "Sub1 i " << ++i << " *pI " << *pI++ << std::endl;
14     Sub2(i++, *pI++);
15     return Sub2(i++, *pI++);
16 }
17
18 int main()
19 {
20     int i = 2;
21     int j[6] = {10, 20, 30, 40, 50, 60};
22     int k = Sub1(i, &j[2]);
23     std::cout << "Main i is " << i << " j[2] is " << j[2]
24               << " k is " << k << std::endl;
25 }
```

Program parameters.cc

3. Simple Calculator Assignment

- (a) Suppose the `switch` statement to compute the various arithmetic operations was as shown below. Does this produce the desired results as specified in the Simple Calculator assignment? Explain your answer.

```
1  switch (delims[0] )
2  {
3  case '+' :
4      result = operands[0] + operands[1];
5      break;
6  case '-' :
7      result = operands[0] - operands[1];
8      break;
9  case '*' :
10     result = operands[0] * operands[1];
11     break;
12    case '/' :
13        result = operands[0] / operands[1];
14        break;
15    }
16
17
18
```

Program simple-calc.cc

- (b) What would be the value of `count`, `operands[0]`, `operands[1]` and `delims[0]` if we called `StringParse` as follows:

```
count = StringParse("abcdcba", "d", operands, delim);
```

4. Describe in detail what this code would do on the mbed module.

```
#include "mbed.h"
DigitalOut l1(LED1);
DigitalOut l2(LED2);
DigitalOut l3(LED3);
DigitalOut l4(LED4);
int main() {
int i=0;
    while(1) {
        i++;
        l1 = (i & 8)>>3;
        l2 = (i & 4)>>2;
        l3 = (i & 2)>>1;
        l4 = i & 1;
        wait(0.5);
    }
}
```