CS1MD3

Day Class
Duration of examination: 50 minutes
McMaster University Midterm Examination October 2008

This examination paper includes 3 pages and 14 questions. You are responsible for ensuring that your copy of the paper is complete. Bring any discrepancy to the attention of your invigilator.

SPECIAL INSTRUCTIONS: This paper must be returned with your answers. Use of McMaster standard (Casio-FX991) calculator only is allowed.

1. (2 marks) An algorithm must satisfy the three criteria: unambiguous, effective, and finite.

2. (4 marks) The three important attributes of a variable are name, type, and value.

3. (4 marks)

```java
import acm.program.*;

public class HelloConsole extends ConsoleProgram {

    public void run() {
        println("hello, world");
    }
}
```

From the above program, ConsoleProgram is a subclass of Program class; ConsoleProgram is a superclass of HelloConsole class.

4. (2 marks) Suppose that \( n \) is of type int, the type of the value of the expression \( 19 + n \) is

(a) int  (b) double  (c) boolean  (d) char

Answer: (a)

5. (2 marks) Suppose that \( n \) is of type int, the type of the value of the expression \( 19.0 + n \) is

(a) int  (b) double  (c) boolean  (d) char

Answer: (b)

6. (2 marks) The type of the value of the expression \( 2 < 3 \) is

(a) int  (b) double  (c) boolean  (d) char

Answer: (c)

7. (2 marks) The value of the expression \( 5 + 3 / 4 \) is

(a) 2  (b) 5  (c) 6  (d) 5.75

Answer: (b)
8. (6 marks) How would you write a Boolean expression to test whether the value of the integer variable \( n \) was nonnegative?

\[(n >= 0) \lor (n > 0) || (n == 0)\]

9. (6 marks) Using Java’s short-circuit evaluation, write a Boolean expression to test whether the integer variable \( m \) is divisible by the integer variable \( n \) when the value of \( n \) is positive.

\[(n > 0) && (m \% n == 0)\]

10. (6 marks) Fill in the truth table for \( && \) operator, given Boolean values \( p \) and \( q \):

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>p &amp;&amp; q</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>false</td>
<td>true</td>
<td>false</td>
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<tr>
<td>true</td>
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<td>false</td>
</tr>
<tr>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
</tbody>
</table>

11. (4 marks) What is the output when the program executes the following segment:

```java
for (int i = 5; i > 1; i--) {
    println(i);
}
```

Output:

5
4
3
2

12. (2 marks) Suppose that the value of the integer variable \( n \) is \(-3\), the output of

\[(n > 0)? println(n) : println(-n);\]

is:

(a) 3         (b) \(-3\)         (c) true      (d) false

Answer: (a)
13. (6 marks) Complete the following program by filling in the boxes:

```java
import acm.program.*;

public class Product extends ConsoleProgram {
    public void run() {
        println("This program multiplies a list of positive integers.");
        println("Enter values, one per line, using " + SENTINEL);
        println("to signal the end of the list.");

        int prod = 1;
        while (true) {
            int value = readInt(" ? ");
            if (value == SENTINEL) break;
            prod *= value;
        }
        println("The product is " + prod ".");
    }

    /* constant SENTINEL */
    private static final int SENTINEL = -1;
}
```

14. (6 marks) Modify the following program so that it centers the square in the window and uses a single constant called SQUARE_SIZE to define the side of the square. Recall that the method getWidth() returns the width of the window and getHeight() returns the height of the window.

```java
import acm.graphics.*;
import acm.program.*;

public class Square extends GraphicsProgram {
    public void run() {
        int x = 10; // [x = (getWidth() - SQUARE_SIZE) / 2;]
        int y = 10; // [y = (getHeight() - SQUARE_SIZE) / 2;]
        int size = 100; // [delete this]

        GRect sqr = new GRect(x, y, size, size); // [replace above size by SQUARE_SIZE]
        add(sqr);
    }

    /* constant SQUARE_SIZE */
    private static final int SQUARE_SIZE = 100;
}
```