TEST 1 PROGRAMMING **November 2008** **COMPUTER ENGINEERING**	 Universidad Carlos III de Madrid

READ THESE INSTRUCTIONS CAREFULLY BEFORE YOU BEGIN WITH THE TEST:

- **Fill all the sheets with a pen, both the personal data and the answers**
- **Do not use a red pen or a pencil**
- **Please fill in your NIA and the actual group in which you belong**
- **The exam should be answered in one hour**
- **The only material allowed on the table are the test and a pen**
- **Use only the sheets of the test to write your answers (you may use the rear side of the sheets if required). Any additional papers will not be collected.**

DO NOT GO BEYOND THIS SHEET, until you are told to do so

Last names	***Name***	
Signature	***NIA***	***Group***

PART 1: QUESTIONS

Question 1 (1 Mark).- What is the difference between the boolean | and ||? *When should we choose || over |?*

Both are logical operators. When | is used both operands are always evaluated, while when || is used the second operand is not evaluated when the first is true.

We should select || when the following expressions depend on the result of the previous. For instance in the following example the last expression depends on the two first ones as they make sure that *a* has a value within the range of the array.

```
public class Main {
      public static void main(String[] args) {
            int a = 0;
            boolean [] bools = {true,false};
            if ((0 > a) || (2 < a) || (false == bools[a])) {
                  System.out.println ("error");
            }
      }
}
```

Question 2 (1 Mark).- Please specify whether the following statement is correct and briefly explain why.
*"When we declare a variable without a type, its type defaults to **void**"*

Incorrect. A variable should always have a type, and the type of a variable can never be void.

Question 3 (1 Mark).- Please specify whether the following statement is correct and briefly explain why.
"The expression of an if conditional should always evaluate to an integer."

Incorrect. The expression of an if conditional should always evaluate to a boolean.

Question 4 (1 Punto).- Please correct the following code.

```
public class Main {
      public static void main (String args) {
            int a = c c == 1;
            float foo = 2f;
            a = Foo;
            char c = 'c';
            String s = 'a';

      }
}
```

A possible solution is the following.

```
public class Main {
      public static void main (String [] args) {
            int c = 1, a = c;
            float foo = 2f;
            a = (int) foo;
            char d = 'c';
            String s = "a";
      }
}
```

Question 5 (1 Mark).- What is the value of the variable named "res" in each of the following cases?

```
a) float a = 1.0f, b = 2.0f; int res =  (((int)a++) + (int)--b);
b) boolean a = false, b = false; boolean res = a & (!b);
c) int c = 0; boolean res = c != 0? false: true;
d) boolean [] c = {true,false}; float f = 0f; boolean res = c[(int)++f];
```

a) res = 2
b) res = false
c) res = true
d) res = false

Question 6 (1 Mark).- For each of the following declarations please explain which is correct and which not. In case that is not correct please suggest a correction (if possible) that does not alter the type of the variables.

```
1) int a= 200; byte b = a;
2) int a = 4; double b = a << 0;
3) char b = a; byte a = 90;
4) boolean a = !false; boolean b = !a;
```

Possible solutions are the following.

```
a) int a= 20; byte b = (byte) a;
b) correct
c) byte a = 90; char b = (char) a;
d) correct
```

PART 2: PROBLEMS

Problem 1 (2 Marks).- A hotel in Madrid has 4 floors. The ground floor consists of 4 rooms. The first floor consists of 14 rooms, while the second and third of 20 rooms. Currently the hotel has the following guests:

- Jack Jennings at room 1 of first floor.
- Tim Lorens at room 4 of ground floor.
- Helena Padova at room 3 of third floor

Please define an array capturing the above information.

A possible solution is the following.

```
public class Main {
      public static void main (String [] args) {
            String [][] hotel = new String [4][];

            hotel[0] = new String [4];
            hotel[1] = new String [14];
            hotel[2] = new String [20];
            hotel[3] = new String [20];

            hotel[1][0] = "Jack Jennings";
            hotel[0][3] = "Tim Lorens";
            hotel[3][2] = "Helena Padova";
      }
}
```

Problem 2 (2 Marks).- Let S be the following set:

$$char[]S=\{'t','f'\};$$

Create an array of 2000 positions of type *char* and populate it in the following manner:

- The slots at an even position should be given the value at position zero *from the set S*.
- The slots at an odd position should be given the value *at position one from the set S*.

A possible solution is the following.

```
public class Main {
	public static void main (String [] args) {
		char [] S = {'t','f'};
		char [] T = new char [2000];

		for (int i = 0; i < 2000; i++) {
			if (0 == (i % 2)) T[i] = S[0];
			else T[i] = S[1];
		}
	}
}
```