



UNIVERSIDAD CARLOS III DE MADRID
PROGRAMMING
Grade in Industrial Technology Engineering

MAY 2013. PART 1: TEST

Surname: _____

Name: _____

NIA: _____

3 Points

Time: 60 min.

Code: 5

Instructions for the answers sheet:

Fill the fields in: name, surname, NIA (i.e. 1000XXXXX). Sign the sheet.

Encode the NIA.

Encode the exam type in the field below the header by filling the appropriate slot. There are two exam types (5 and 6). From left to right, use the first slot for exam type 1, the second slot for exam type 2, etc.

Mistyped answers cannot be corrected. If necessary, ask your professor for a new empty sheet. It is recommended to write your answers on the questions sheet and then copy them to the answers sheet.

Do not write on the black section –the test would be invalid.

The exam consists of 30 multiple-choice questions. Each question has only one right answer. Right answers get +0.1 points; wrong answers get -0.03 points.

TEST

1. What is the output of the program below (i.e., what is printed on the screen)?

```
#include <stdio.h>

int main(void) {
    int i, j, r;

    for(i=0; i<2; i++) {
        for(j=0; j<3; j++) {
            r = i+j;

            if(r % 2 == 0)
                printf("%i ", r);
        }
    }
    return 0;
}
```

- a. Nothing
- b. 0, 2, 4, 6
- c. 0, 2, 2
- d. 0, 2, 4

2. Select the right assertion:
- a. Basic linear search is the most efficient search algorithm when the input array is sorted
 - b. Binary search can be applied only to arrays with two elements
 - c. Optimized linear search can only be applied to arrays with an uneven number of elements
 - d. Searching in sorted arrays can be done more efficiently than searching in unsorted arrays
3. Select the right assertion about the clock generator of a computer:
- a. It is a component of the control unit
 - b. It is composed of several registries and a decoder
 - c. It is used to automatically synchronize the date and hour of the computer with an Internet time server on a regular basis
 - d. It includes the arithmetic-logic unit

4. Select the right assertion, according to the program below:

```
#include <stdio.h>

int main(void) {
    float num, *r;
    printf ("Enter a number:\n");
    scanf("%f", &num);
    r = 2*num;
    printf("%f", r);

    return 0;
}
```

- a. Compilation error
 - b. `r` stores the float value resulting from `num` multiplied by 2
 - c. The program prints the value stored in the variable pointed by `r`
 - d. The program prints the memory address of the `r` variable
5. What is the output of the program below (i.e., what is printed on the screen)?

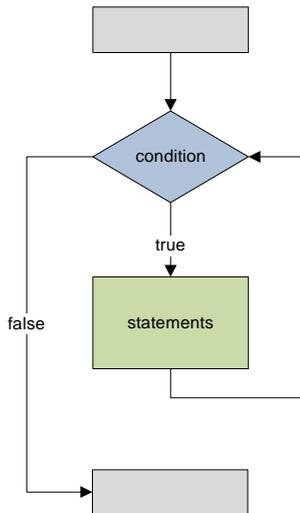
```
#include <stdio.h>

int main(void) {
    int a = 10, b;

    while(a > 0) {
        b = a - 1;
        printf("%i ", b);
        a = a - 1;
    }
    return 0;
}
```

- a. 10, 9, 8, ..., 0
- b. 10, 9, 8, ..., 1
- c. 9, 8, ..., 1
- d. 9, 8, ..., 0

6. The flow diagram below represents the loop instruction:



- a. while
- b. do-while
- c. if-else
- d. switch

7. Given the structure below, how can we declare a 10-element array of the type `Song` and initialize the values of the first song element?

```
struct Song {  
    char group[20];  
    float length;  
};
```

- a. It is not possible, because arrays cannot store data structures
- b. It is not possible, because all the elements of the array must be initialized
- c.

```
struct Song downloads[10];  
strcpy(downloads[0].group, "U2");  
downloads[0].length = 20.7;
```
- d.

```
struct Song downloads[10];  
strcpy(downloads.group[0], "U2");  
downloads.length[0] = 20.7;
```

8. Select the false assertion about the first generation of computers:

- a. Vacuum tubes were used
- b. Programs were developed in high-level programming languages
- c. Computers were mostly used in military and scientific applications
- d. Computers were heavy and big machines

9. Let us assume a character string named `s1` is defined in the `main` function. Select the false assertion:

- a. The compiler automatically adds a null character '\0' at the end of the string
- b. The string can be initialized when declared
- c. Given another string s2, the instruction s2=s1; copies s2 contents into s1
- d. The instruction printf("%s", s1); prints s1 contents on the screen

10. Select the right assertion, according to the program below:

```
#include <stdio.h>
#include <string.h>

struct Person {
    char name[50];
    int age;
};

struct Filming {
    char place[256];
    float budget;
};

struct Movie {
    struct Person director;
    struct Person actor1;
    struct Person actor2;
    struct Filming data;
};

int main(void){
    struct Movie my_movie;
    strcpy (my_movie.director.name, "Almodovar");
    printf ("%s \n", my_movie.director.name);

    return 0;
}
```

- a. Compilation error, because Person structure is repeated in three members of structure Movie
- b. Compilation error, because a structure cannot be a member of other structure
- c. Compilation error, because the value of the member name of structure Person is not correctly assigned
- d. All the previous answers are wrong

11. Select the right assertion. Data managed by a computer:

- a. Can only be numerical
- b. Is ultimately represented according to the 8 possible states of electronic devices
- c. Is represented with sequences of bits
- d. Is lost when the computer is turned off

12. Select the right assertion, according to the program below:

```
#include <stdio.h>

int main(void) {
```

```

int list[5] = {1, 3, 5, 7, 9};
int *p1, *p2;
int x;

x = *(list);
p1 = &list[0];
p2 = list;

return 0;
}

```

- The instruction `x = *(list)` gives a compilation error
- The instruction `p2 = list` gives a compilation error
- After the execution of the instruction `p1 = &list[0]`, `p1` has value 1
- After the execution of the instruction `p2 = list`, `*p1` and `*p2` have value 1

13. Select the right assertion:

- Using a computer requires knowledge of the specific programming language used by this computer
- Using a computer requires knowledge of the design of the specific operating system used by this computer
- Using a computer requires knowledge of the hardware specifications of this computer
- The operating system is a layer between the hardware and the software that allows users to run the same program in different machines

14. What is the output of the program below (i.e., what is printed on the screen)?

```

#include <stdio.h>
int main(void) {
    int i=0, r;

    while(i<3) {
        switch(i) {
            case 0:
                r = i;
                break;
            case 1:
                r = i+1;
                break;
            case 2:
                r = i+2;
            case 3:
                r = i+3;
        }
        i++;
    }
    printf("%i ", r);
    return 0;
}

```

- 6
- 5
- 4
- 3

15. Select the right assertion. Solid state units (SSD):
- Are rarely used, since they have very limited storage capabilities (a few megabytes)
 - Cannot be used through a USB interface
 - Use integrated circuits
 - Can be written only once
16. Select the right assertion. The IEEE754 standard:
- Is used to represent real numbers by means of three separated fields: base, mantissa and exponent
 - Allows for the representation of real numbers without losing any precision
 - Uses 32 bits, which allows for the representation of a very limited range of values (approximately, between -1000 and +5000)
 - All the previous answers are false
17. Which statement should be used to complete correctly the code below?

```
#include <stdio.h>

struct Fraction {
    int n;
    int d;
};

void product(struct Fraction f1, struct Fraction *r,
            struct Fraction f2);

int main(void) {
    struct Fraction a={2,5}, b={3,6}, prod;
    // <-- INSERT STATEMENT HERE!

    return 0;
}

void product(struct Fraction f1, struct Fraction *result,
            struct Fraction f2) {
    (*result).n = f1.n * f2.n;
    (*result).d = f1.d * f2.d;
    return;
}
```

- `product(a, prod, b);`
 - `product(&a, prod, &b);`
 - `product(a, &prod, b);`
 - None of the previous answers is correct, any of them results in a compilation error
18. The initialization (or pre-block) instruction of the `for` loop instruction runs:
- Each time that the associated statements block is executed, after the block
 - Each time that the associated statements block is executed, before the block
 - The first time that the `for` instruction is reached, even though the associated statements block is not executed
 - The first time that the `for` instruction is reached, but only if the associated statements block is executed

19. Which is the binary representation of the decimal number 20?

- a. 1234
- b. AF1
- c. 10100
- d. None of the previous answers is correct

20. Select the right statement:

- a. The main memory controls the functioning of the computer
- b. The processor stores all data and instructions of a running program
- c. The processor includes the circuits that perform arithmetic and logic operations
- d. The processor directly fetches data to perform arithmetic and logic operations from the main memory

21. Select the right assertion. Strictly speaking, compilers:

- a. Translate programs in assembly language into machine language
- b. Translate programs in a high-level language into object code
- c. Translate programs in a high-level language into executable programs
- d. Translate programs in machine language into assembly language

22. Select the right assertion, according to the program below:

```
#include <stdio.h>

void printData(int b, int a);

int main(void) {
    int a, b;

    a = 5;
    b = 10;
    printData(5, 10);

    return 0;
}

void printData(int b, int a) {
    printf("VALUES: %i, %i", a, b);

    return;
}
```

- a. VALUES: 10, 5
- b. VALUES: 5, 10
- c. Compilation error. The program uses global variables
- d. Compilation error. The call to `printData` function is wrong

23. Select the right assertion about optical disks:

- a. The capacity of a DVD is larger than the capacity of a CD-ROM because the pits used to store data (*grooves*) in DVDs are smaller

- b. The capacity of a BluRay disk is larger than the capacity of a DVD because a second physical layer is created inside the disk
 - c. Data storage in optical disks is based on the magnetic properties of the disk
 - d. Data is directly stored in optical disks: a pit means a '0', a land means a '1'
24. Select the wrong assertion:
- a. An algorithm is a set of instructions provided to a computer to perform a process
 - b. Algorithms encompass a finite number of steps
 - c. Flow diagrams are graphical representations that help to design the sequence of instructions of an algorithm in order to support program development
 - d. Pseudo-code is used to describe an algorithm with words very similar to the natural language
25. The Internet is:
- a. A packet switching net of networks based on the TCP/IP protocol
 - b. A circuit switching net of networks based on the TCP/IP protocol
 - c. A circuit switching net of networks based on the FTP/HTTP protocol
 - d. All the previous answers are wrong
26. Select the right assertion. Let us suppose that a variable declared in the `main` function is passed by value as a parameter in a function call:
- a. The formal parameter cannot be changed inside the function (this results in a compilation error)
 - b. The value of the variable does not change even though the value of the formal parameter is modified inside the function
 - c. The value of the variable changes if the value of the formal parameter is modified inside the function
 - d. The value of the variable cannot be used after the call, because the formal parameter is removed after the function finishes
27. Select the right assertion, according to the program below:

```
#include <stdio.h>

int main(void) {
    int a[10] = {1,2,3,4,5,6,7,8,9,10};
    int i;

    for(i=1; i<=10; i++) {
        printf("%i ", a[i]);
    }

    return 0;
}
```

- a. The program is correct. It prints on the screen all the values of the array `a`
- b. The program is not correct. `printf("%i ", a[i]);` should be changed to `printf("%i ", &a[i]);`
- c. The program is not correct. It prints on the screen only the first 9 values of the array `a`
- d. The program is not correct. It accesses to a memory address that has not been allocated

28. What is printed on the screen as a result of the program below?

```
#include <stdio.h>

int main(void) {
    int a=4, b=3, largest;

    while ( a<4 || b<100 ) {
        if(a>b){
            largest = a;
        } else {
            largest = b;
        } else {
            largest = 0;
        }

        a = a+largest;
        b = b*largest;
    }

    printf("%i %i", a, b);

    return 0;
}
```

- a. 4 3
- b. 20 144
- c. 8 12
- d. None of the previous answers is right

29. Select the wrong assertion. Compiled languages have some advantages over interpreted languages, because they:

- a. Allow us to compile a program once and run it several times (without requiring a new compilation)
- b. Allow us to compile a program for an operating systems and then run it in any other operating system
- c. Allow us to run a program without having the compiler installed
- d. Provide syntax error detection when a program is compiled

30. Given the following code, which one of the function prototypes below is compatible with the function call?

```
int main(void) {
    float n1, n2;
    float r1[2], r2[2];
    ...
    n1 = calculation(r1, r2, n2);
    ...
}
```

- a. float calculation (float a, float b, float c[])
- b. float calculation(float a[], float b[], float c[])
- c. float calculation(float a, float b, float c)
- d. float calculation(float a[], float b[], float c)