Universitaty of Bucharest
Faculty of Physics
Informatics C/C++ (July, 2016)

1. All strings with lengths of maximum 4 distinct characters in the set $\{a, t, o, m, i, c\}$ are generated by using the backtracking method, in lexicographic order. First 5 generated strings are: `a`, `ac`, `aci`, `acim`, `acio` (in that order). Imediately after the string `atm` the following one is generated:
a. `ato`   **b.** `atmc`   **c.** `atmi`   **d.** `iatm`

2. Consider the function `f`, defined below. The return value of the call `f(1,3)` is
```
int f(int x,int y)
{ if(x*2>y)
  return x;
  return f(x*2,y);
}
```
a. 1   **b.** 2   **c.** 3   **d.** 4

3. The real variable `x` contains the arithmetic average of the values of the variables `x,y,z,w` after executing the following C/C++ statement:
a. `x =(x+y+z+w)/2`   **b.** `x =(x+y+z+w)/2/2`   **c.** `x =(x+y+z+w/2)`   **d.** `x+y+z+w/4`

4. The C/C++ statement
`!(-50>=x) && (x<=-10) || (x>=-5) && !(x>5)`
evaluates to 1 if and only if the real variable `x` is in the set:
a. $(-\infty,-10] \cup [5,\infty)$ **b.** $[-50,-10] \cup (-5,5)$ **c.** $(-50,-10) \cup (-5,5)$ **d.** $(-50,-10] \cup [-5,5]$

5. Consider the following algorithm, written in pseudocode. The expression `x%y` gives the remainder of the ratio of the natural number `x` to the natural non-zero number `y` and `[z]` gives the integer part of the real number `z`. What is the number displayed after executing the algorithm sequence, if the variable `n` is `1107`, and `m` is `1238`?

```
read n,m
(natural numbers)
┌if n<m then
│  x←n
│  n←m
│  m←x
└■
p←1
┌while m>0 do
│  c←m%10
│  m←[m/10]
│  n←n-p*c
│  p←p*10
└■
write n
```

a. 0   b. 131   c. 1107   d. 123

6. Write in pseudocode an algorithm equivalent with that indicated above (item 5.) but without loops.
a. `read n,m`   b. `read n,m`   c. `write (n-m)`   d. `write |n-m|`
    `write (n-m)`   `write |n-m|`

7. Consider the oriented graph with **6** vertices, numbered from **1** to **6**, reprezented by the adjacency lists indicated below. Two paths are distinct if different by at least one segment. The number of elementary distinct paths from vertex **2** to vertex **3** is:

```
1: 3
2: 1, 5, 6
3: empty list
4: 3
5: empty list
6: 4, 5
```
a. 0   **b.** 1   **c.** 2   **d.** 3

8. Leafs of the tree structure with 8 nodes (except for the root node, numbered 0), numbered from 1 to 8, represented by the „parent" vector (6,6,5,0,6,4,4,7) are:
a. 1,2,3,8   **b.** 1,2,8   **c.** 3,7   **d.** 4,6,7

9. In the code sequence below, a is a string with at most 100 characters, and variables i and k are integers. Write the string displayed after executing that code sequence.
```
k='a'-'A';
strcpy(a,"polariton");
for(i=0;i<strlen(a);i++)
if(strchr(" aeiou" ,a[i])!=NULL)
a[i]=a[i]-k;
cout<<a; | printf(" %s" ,a);
```

a. plrtn   **b.** pOlArItOn   **c.** OAIO   **d.** POLARITON

10. Natural numbers with four digits are generated in increasing order by using the backtracking method with digits in the set A={1,2,3,4,5}, observing the condition that two sucessive odd digits are not allowed. The first eight numbers generated this way are, in this order, 1212, 1214, 1221, 1222, 1223, 1224, 1225, 1232. The number of generated values with the most significant digit 2 and the least significant digit 4 is:
a. 20   **b.** 16   **c.** 12   **d.** 9

11. What is the string displayed after calling the function f() defined below with the argument 13579 (as in f(13579);)?

```
void f (int x)
 { cout<<"*"; | printf("*");
   if(x>0) {
    cout<<x; | printf("%d",x);
    f(x/100);
    cout<<"*"; | printf("*");
   }
}
```
a. *13579*135*1****   **b.** 13579*   **c.** ****   **d.** 135**

12. The function getchar() reads one character from the implicit input device (keyboard). The following code fragment results in displaying the character:
```
char ch;
for(ch=getchar(); ch != 'q'; ch=getchar());
printf("%c\n",ch);
```
a. a   **b.** q   **c.** z   **d.** Nothing is displayed