



UNIVERSITATEA BABEȘ-BOLYAI
FACULTATEA DE MATEMATICĂ ȘI INFORMATICĂ



Bachelor Degree Exam, June 2014
Computer Science - English

Subject 1

Write a program in one of the programming languages Python, C++, Java, C# that:

- Define a class *Student* with a private field *name* of type string, a public *constructor* that initializes the *name*, and a public method *toString()* that returns the *name* of the student.
- Define a class *StudentWithScholarship* derived from *Student* with a private attribute *scholarshipValue* of type integer, a public *constructor* that initializes the *name* and the *scholarshipValue* fields, and also the overridden public *toString()* method that appends the *scholarshipValue* to the value returned by the same method of the base class.
- Define a *function* that builds a *map* containing an object of type *Student* having the *name* "Ionescu" and an object *StudentWithScholarship* having the *name* "Popescu" and the *scholarshipValue* equal to 200. The *name* values will be the *keys* and the corresponding values will be the objects.
- Define a *function* that receives two parameters, a *map* of type described above at c) and a *char* value, and checks if the *map* contains at least an object having the *name* starting with the given character.
- The *main* function of the program calls the function indicated at c) to build that map, then it reads a *text* string from the console and if the *map* contains an object having the *name* equal to the *text* then the program prints that object, otherwise it prints „not found”. Finally, using the function defined at d), the program checks whether the *map* contains objects having *names* starting with the first character of *text* and prints the result.
- For the *map* data type used in the program, write the specifications of the used operations.

You can use existing libraries for data structures (Python, C++, Java, C#). In case you do not use existing libraries, please only specify the interface of the needed custom types.

Subject 2

- Identify the functional dependencies for the following information about a faculty:
 - scholarships for students:** id (unique), name, description, company/organization (name, web page) that sponsors the scholarship, duration (in number of months), monthly amount, list of applicants;
 - students:** personal numerical code (unique), name, group, year of study, specialization, scholarship evaluation score (the same for all scholarships), list of scholarships applied for (in order of preference);

[Handwritten signatures and marks at the bottom of the page]

Create a relational database, having all tables in 3NF, for the above information. **Justify** that the resulting tables are in 3NF.

- b. Given the database created at point a, express the following queries using relational algebra or Select-SQL:
- b1. Name, specialization and evaluation score of students who applied for the scholarship with id "BM" and **did not** applied for the scholarship with id "BT".
 - b2. For all the scholarships with the most applicants determine the name of scholarships, name of company, number of applicants and the average of students' scores.

Subject 3

a) Consider the below Linux C code compiled as **p**.

1	#include <unistd.h>	/home/scs/exam/p s ls
2	#include <stdio.h>	
3	int p[2];	
4	pid_t mypid;	/home/scs/exam/p c pwd
5	main (int argc, char *argv[]){	
6	pipe (p);	
7	if (fork () == 0){	
8	close (p[0]);	
9	if (argv[1][0] == 'c'){	
10	*execlp (argv[2], argv[2], 0);	
11	printf ("Exec finished\n");	
12	}	
13	mypid = getpid ();	
14	printf ("p=%d: pp=%d\n", mypid, getppid());	
15	write (p[1], &mypid, sizeof (int));	
16	exit (0);	
17	}	
18	close (p[1]);	
19	read (p[0], &mypid, sizeof (int));	
20	printf ("Pid parinte %d: pid fiu:%d\n",getpid(),mypid);	
21	}	

- a.1 What will the 2 runs from column 3 display on the screen? Explain the results.
- a.2 What will the 2 runs from column 3 display on the screen if we eliminate line 16 (exit(0)). Explain the results.

b) Consider the shell script below.

echo \$#: \$*	./s.sh 1 2 3
p=`echo \$1 grep ^[^\0-9]*[0-9]\$`	./s.sh 1 22 3
if ["\$p" != ""]	./s.sh a1 2
then	./s.sh 1 2a 3
shift	
./s.sh \$*	
fi	

- b1. Explain line 2.
- b2. What will the 4 runs from column 2 display on the screen? Explain the results.

Remarks: All subjects are compulsory. Each subject will be graded with a mark between 1 and 10 by both evaluators.

Time limit: 3 hours