Subject 1
Write a program in one of the programming languages Python, C++, Java, C# that:

a. 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. 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

a. 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);
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.

```c
#include <unistd.h>
#include <stdio.h>

int main(int argc, char *argv[])
{
    pipe(0);
    if (fork() == 0) {
        close(0);
        if (argc <= 2) {
            execlp(argv[2], argv[2], 0);
            printf("Exec finished\n");
        }
        getpid();
        printf("p=*d: pp=td
", mypid, getppid());
        exit(0);
    }
    read(0, &mypid, sizeof(int));
    printf("Pid parinte *d: pid fiu:*d
", getpid(), mypid);
}
```

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.

```bash
echo $* $*
p='echo $1|grep "^[0-9]+$"
if [ "$p" = "" ]
then
    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