

面向对象程序设计 C++ 第 6 次实验

要求:

- i) 提供编程思路、关键代码、程序运行结果（截图、输出结果等）；
- ii) 可以以附录形式给出完整的源代码，同时需要将源代码文件（.h 文件、.cpp 文件等），和作业报告一起打包提交，压缩包命名为“学号_姓名”；
- iii) 以 .docx 或 .pdf 格式撰写与提交作业，作业以“学号_姓名”命名。非编程题直接写在 word 文档里，编程题需建立子文件夹存放代码文件，子文件夹命名为“hwx_y”，表示为第 x 次作业第 y 题。
- iv) 独立完成，严禁抄袭。

题目 1

 教材 6.8 节，第 23 题（Time 类）

题目 2

 修改上次的面向对象程序 Computer Labs，要求如下：

- 把 ComputerLab 类作为 User 类的友元类，并在 ComputerLab 对象中直接访问 User 对象的私有数据成员。
- 为 ComputerLab 类重载操作符 + 和 - ，分别实现以下的用户登录和退出功能：
 - void operator + (loginReq &r);
 - void operator - (logoffReq &r);

// loginReq 表示登录请求的类型

```
struct loginReq {  
    User* userPointer; //指向当前请求登录的用户对象  
    int labNum;        //用户请求登录的 lab 的 number  
    int stationNum;    //用户请求登录的 station 的 number  
    bool flag;         //flag=true 表示登录成功，flag=false 登录失败  
}
```

// logoffReq 表示注销请求的类型

```
struct logoffReq {  
    User* userPointer; //指向当前请求注销的用户对象  
    bool flag;         //flag=true 表示注销成功，flag=false 注销失败  
}
```

题目 3

✚ Write a computer program that could be used to track users' activities.

Lab Number	Computer Station Numbers
1	1-3
2	1-4
3	1-5
4	1-6

- You run four computer labs. Each lab contains computer stations that are numbered as the above table.
- **There are two types of users:** student and staff. Each user has a unique ID number. The student ID starts with three characters (for example, SWE or DMT), and is followed by three digits (like, 001). The staff ID only contains digits (for example: 2023007).
- Whenever a user logs in, the user's ID, lab number, the computer station number and login date are transmitted to your system. For example, if user SWE001 logs into station 2 in lab 3 in 01 Dec, 2022, then your system receives (+ SWE001 2 3 1/12/2022) as input data. Similarly, when a user SWE001 logs off in 01 Jan, 2023, then your system receives (- SWE001 1/1/ 2023). Please use = for end of input.
- When a user logs in or logs off successfully, then display the status of stations in labs. When a user logs off a station successfully, display student id of the user, and the number of days he/she logged into the station.
- **When a user logs off, we calculate the price for PC use.** For student, we charge 0 RMB if the number of days is not greater than 14, and 1 RMB per day for the part over 14 days. For staff, we charge 2 RMB per day if the number of days is not greater than 30, and 4 RMB per day for the part over 30 days.
- If a user who is already logged into a computer attempts to log into a second computer, display "invalid login".
If a user attempts to log into a computer which is already occupied, display "invalid login".
If a user who is not included in the database attempts to log off, display "invalid logoff".

附加要求：

1. 必须是包含以下内容的面向对象程序：ComputerLab 类、基类 User 及其派生类 Student 和 Staff、main 函数。
2. 把 ComputerLab 类作为类 User、Student、Staff 的友元，使它直接访问各类用户的私有成员。
3. 为 ComputerLab 类重载操作符 + 和 -，分别实现 Staff 和 Student 的登录和退出功能：

//请合理设计登录和退出请求的数据类型

- void operator + (StaInReq &r); //Staff 登录
- void operator + (StuInReq &r); //Student 登录
- void operator - (StaOffReq &r); //Staff 退出
- void operator - (StuOffReq &r); //Student 退出

样例输入

```
+ SWE100 1 1 1/1/2016
+ DMT200 2 6 02/04/2016
+ SWE400 1 1 1/01/2016
+ SWE400 4 3 10/1/2016
+ SWE400 2 1 1/1/2015
+ 2019007 2 3 1/1/2015
- 2019007 1/12/2016
- DMT700 1/12/2016
+ SWE800 1 6 10/10/2013
+ SWE900 5 1 10/10/2014
- SWE700 1/12/2016
=
```

样例输出

```
1 1: SWE100 01/01/2016 2: empty 3: empty
2 1: empty 2: empty 3: empty 4: empty
3 1: empty 2: empty 3: empty 4: empty 5: empty
4 1: empty 2: empty 3: empty 4: empty 5: empty 6: empty

invalid login

1 1: SWE100 01/01/2016 2: empty 3: empty
2 1: empty 2: empty 3: empty 4: empty
3 1: empty 2: empty 3: empty 4: empty 5: empty
4 1: empty 2: empty 3: empty 4: empty 5: empty 6: empty

invalid login

1 1: SWE100 01/01/2016 2: empty 3: empty
2 1: empty 2: empty 3: empty 4: empty
3 1: empty 2: empty 3: empty 4: empty 5: empty
```

4 1: empty 2: empty 3: empty 4: empty 5: empty 6: empty

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

invalid login

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: 2019007 01/01/2015 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

2019007 log off, time: 700 days, price: 2740 RMB

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

invalid logoff

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

invalid login

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

invalid login

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty

invalid logoff

1 1: SWE100 01/01/2016 2: empty 3: empty

2 1: empty 2: empty 3: empty 4: empty

3 1: empty 2: empty 3: empty 4: empty 5: empty

4 1: empty 2: empty 3: SWE400 10/01/2016 4: empty 5: empty 6: empty