**Python Online Judge System**

**System Design Specification (SDS)**

**Version 4.1**

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1. Document Change Log

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| --- | --- | --- | --- |
| ***Change Date*** | ***Changed By*** | ***Version*** | ***Change Description*** |
| 2019-04-14 | Yuepeng Long | 1.0 | Prepared Document |
| 2019-05-20 | Wenbo Zhao, Jianxin Liu | 2.0 | Modify the UI interface and features |
| 2019-05-26 | Qiaomu Zhang | 3.0 | Add some UI interfaces |
| 2019-05-26 | Wenbo Zhao, Jianxin Liu | 4.0 | Add some information for the admin page |
| 2019-05-26 | Yuepeng Long | 4.1 | Final check and bug fixes |
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1. Design Overview

The purpose of this system is to provide a platform for teachers and students in the Python programming class. Students can complete the Python programming problems set by the teacher. The system automatically evaluates pieces of code from students and help students correct them. At the same time, teachers can also use this system to arrange tasks with DDL and get each student's grades based on task statistics.

The system will interact with all users as web pages. The background is implemented using Flask and MariaDB, and the front end uses the Bootstrap framework.

1. Tools and Standards

## Tools

Main components:

* HTML 5
* jQuery
* Bootstrap v4
* Tabler 0.0.34
* Python 3.7
* Flask 1.0.2
* Redis 4.0.9
* MariaDB

Packages in Python 3:

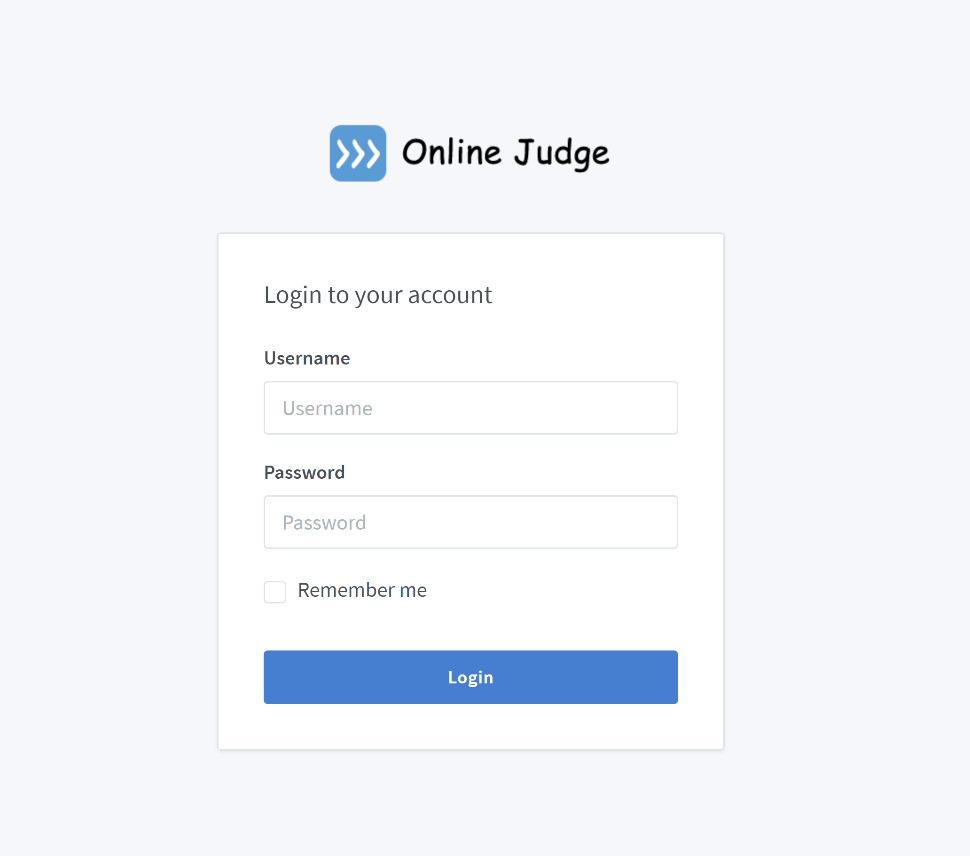
* pymysql
* python-dotenv
* Flask\_SQLAlchemy
* Flask\_Migrate
* Flask\_Script
* Flask\_Login
* Flask\_WTF
* flask\_uploads
* flask\_rq2
* pillow

## Standards

* Testing on latest stable version of Google Chrome browser (74.0.3729.169 (64-bit) or later) and Mozilla Firefox browser (59.0.2 (64-bit) or later), no longer support IE 8 / IE 9.
* Using HTML5 standard.
* Using UTF-8 encoding standard.

1. User Interface Design

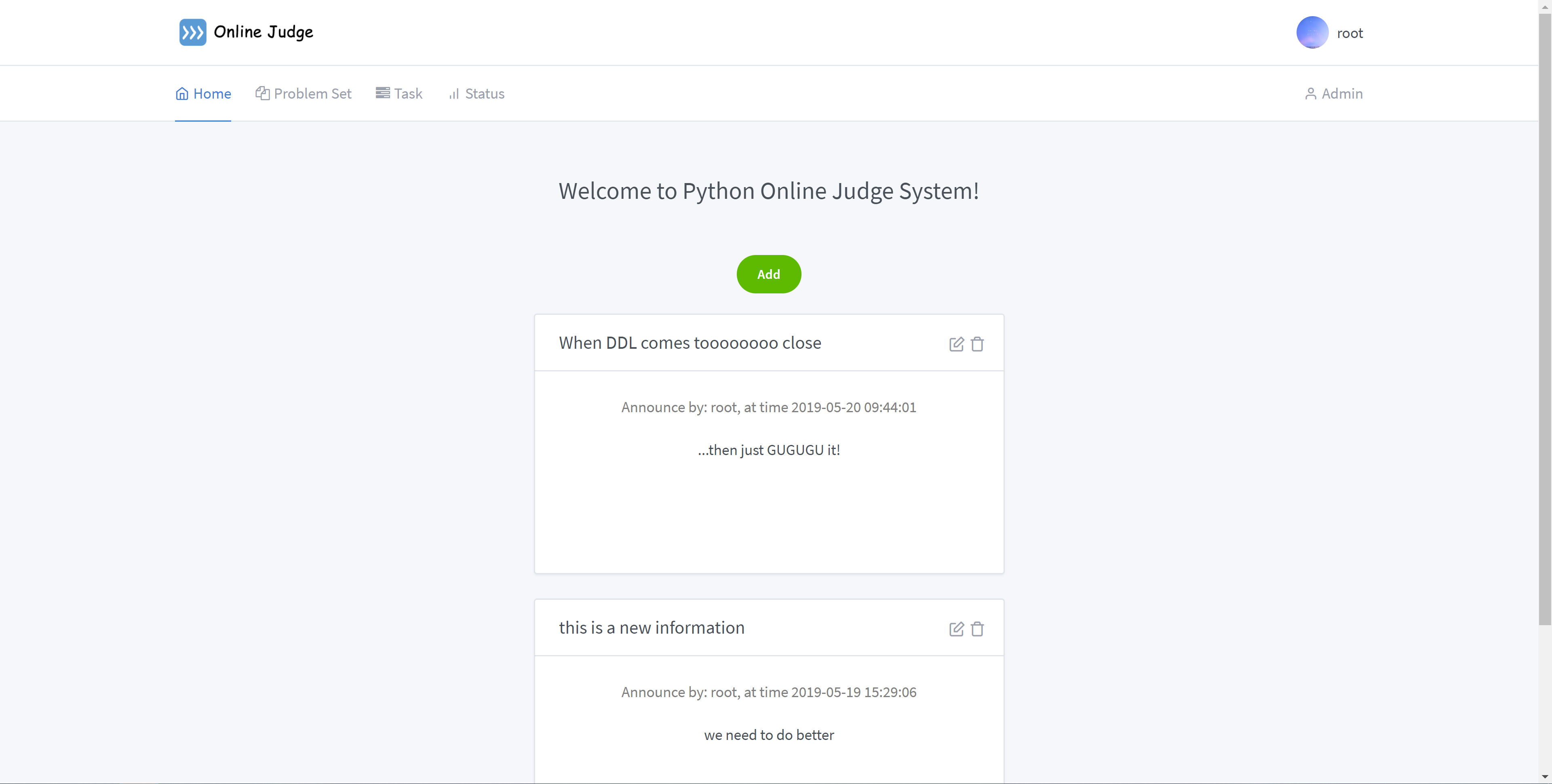
## Login & Homepage



*Figure 1 Login page*

This page is a login page. A form with a username input box, password input box, and a submit button will be displayed on the page. The password entry area will use "." instead of the raw input.

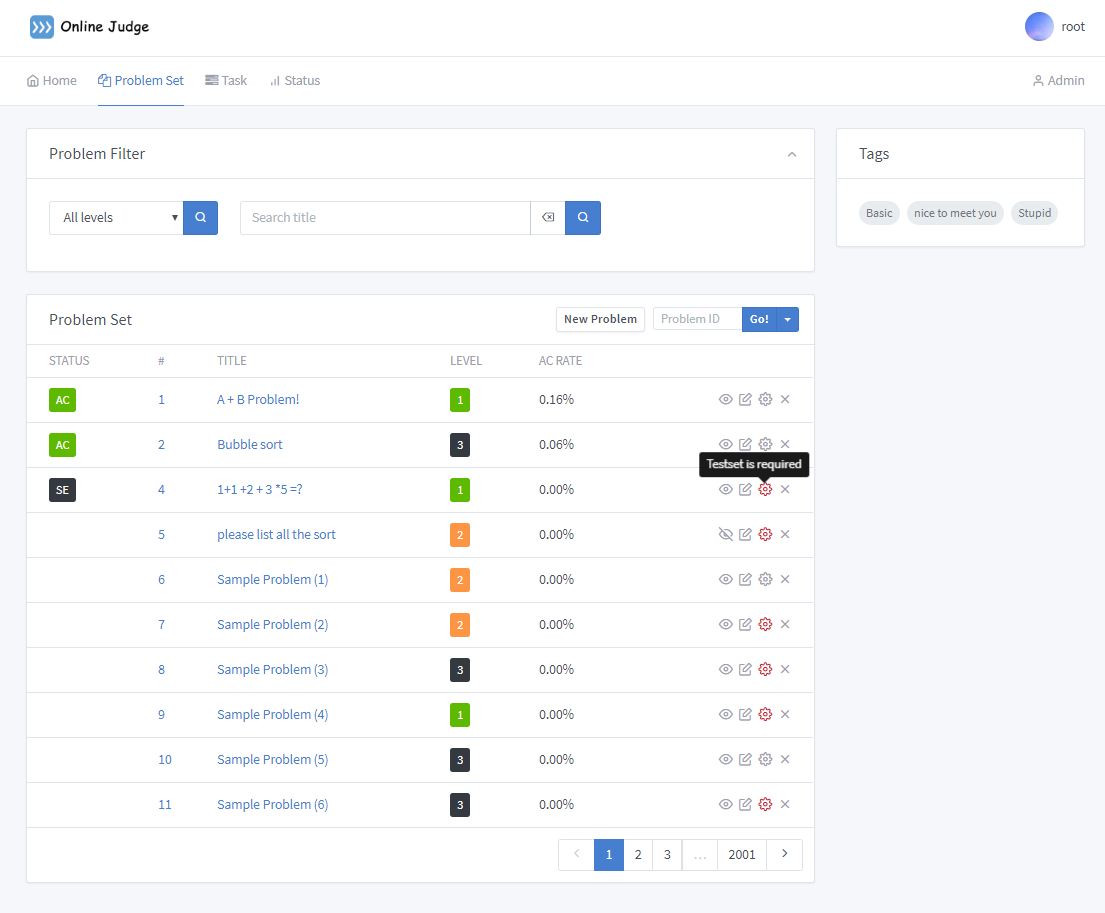
Users are not allowed to register by themselves. Accounts are registered by teachers only (See Section 5.5).



*Figure 2 Home page*

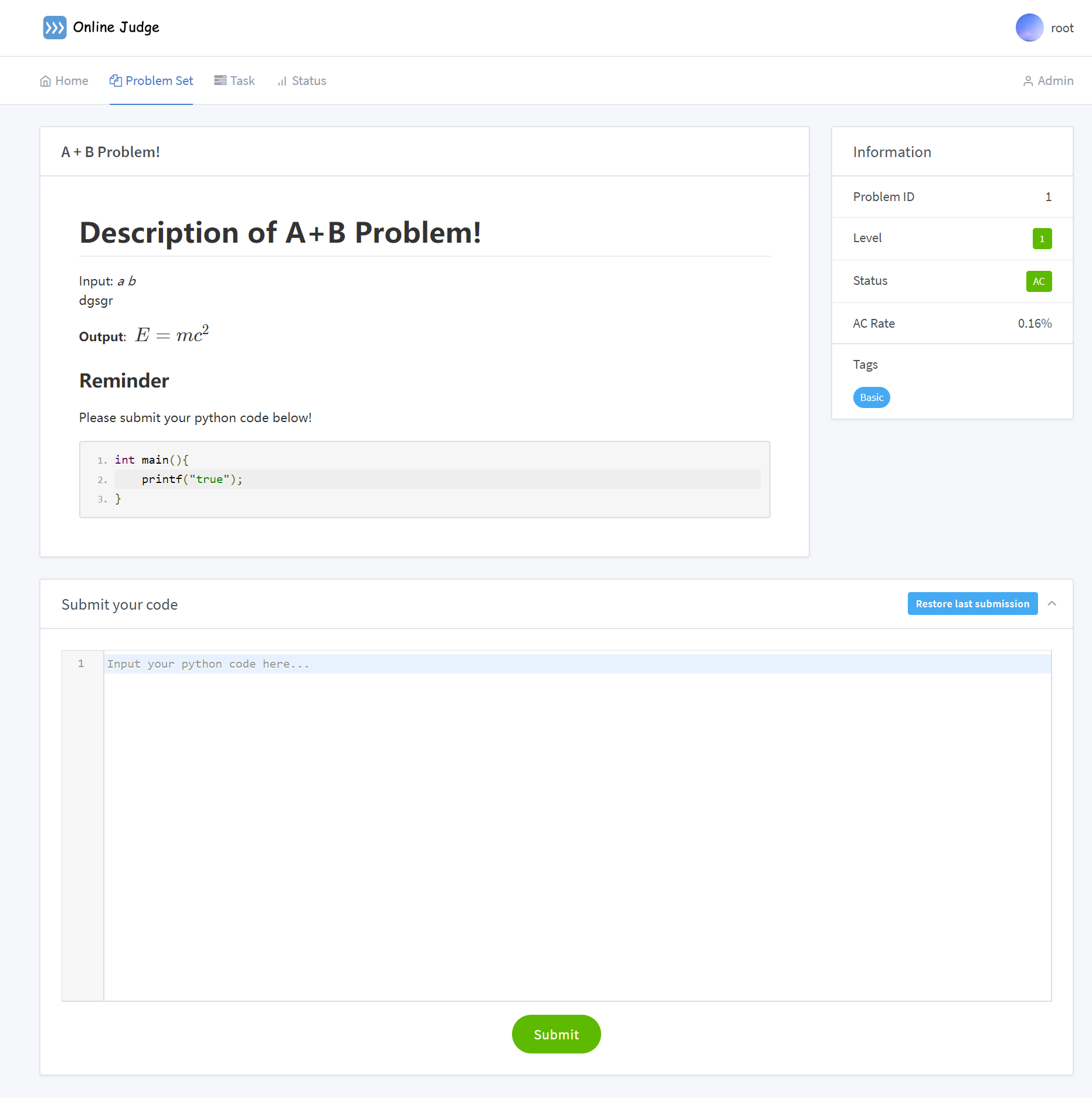
This is the home page, and the upper part is the navigation bar that is available for each page afterwards. Students can see some announcements issued by the teacher, and teachers can add new announcements while browsing the announcements.

## Problem Set



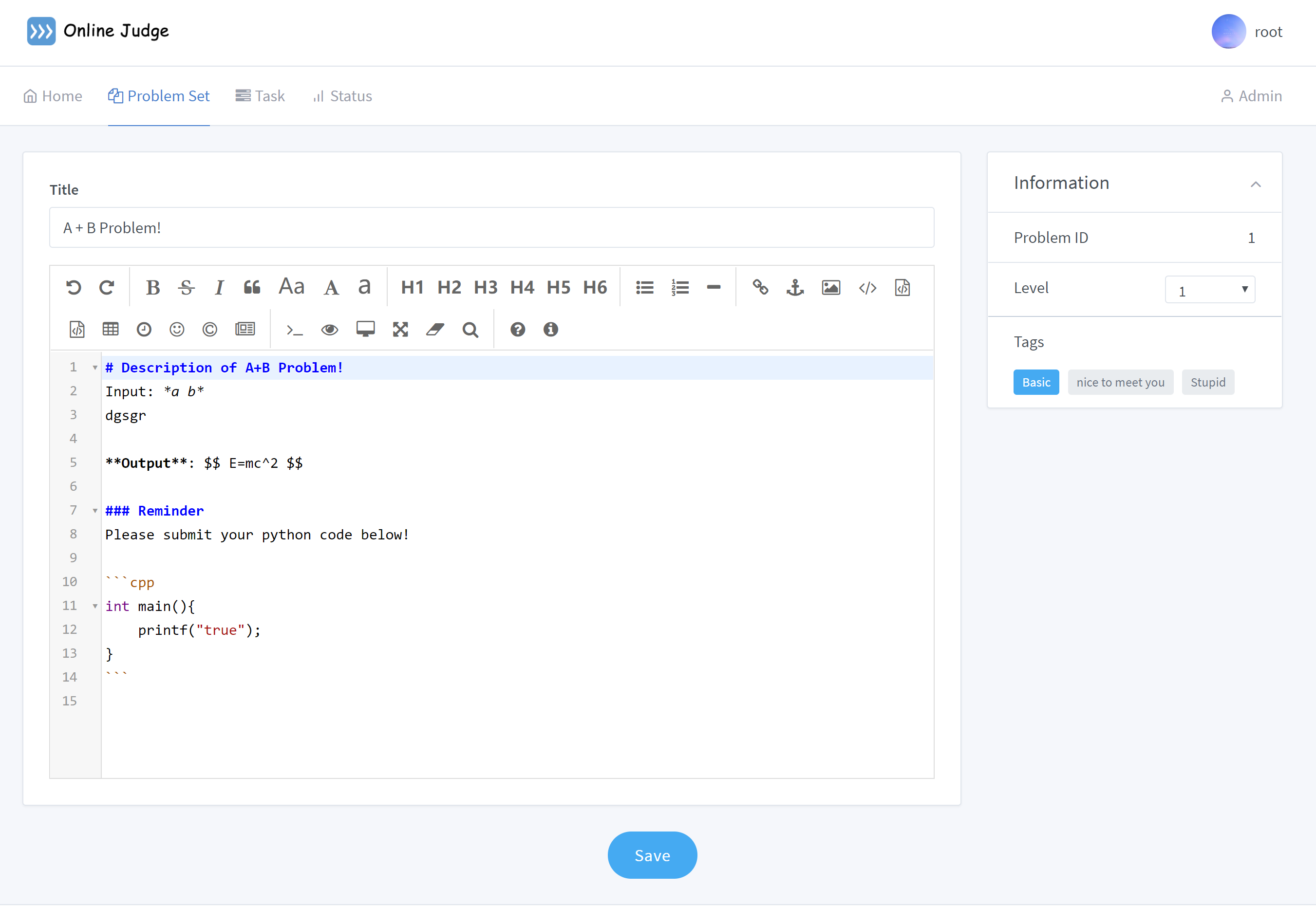
*Figure 3 Problem Set page*

After login, users can via the navigation bar to browse problem set. Problems have their own tags for users to filter. Users not only can click the tags in the right to get all the corresponding problems, but also can input the keyword in the search blanket to look for specific problems. Level filter is also available for all users to specify difficulty of problems.



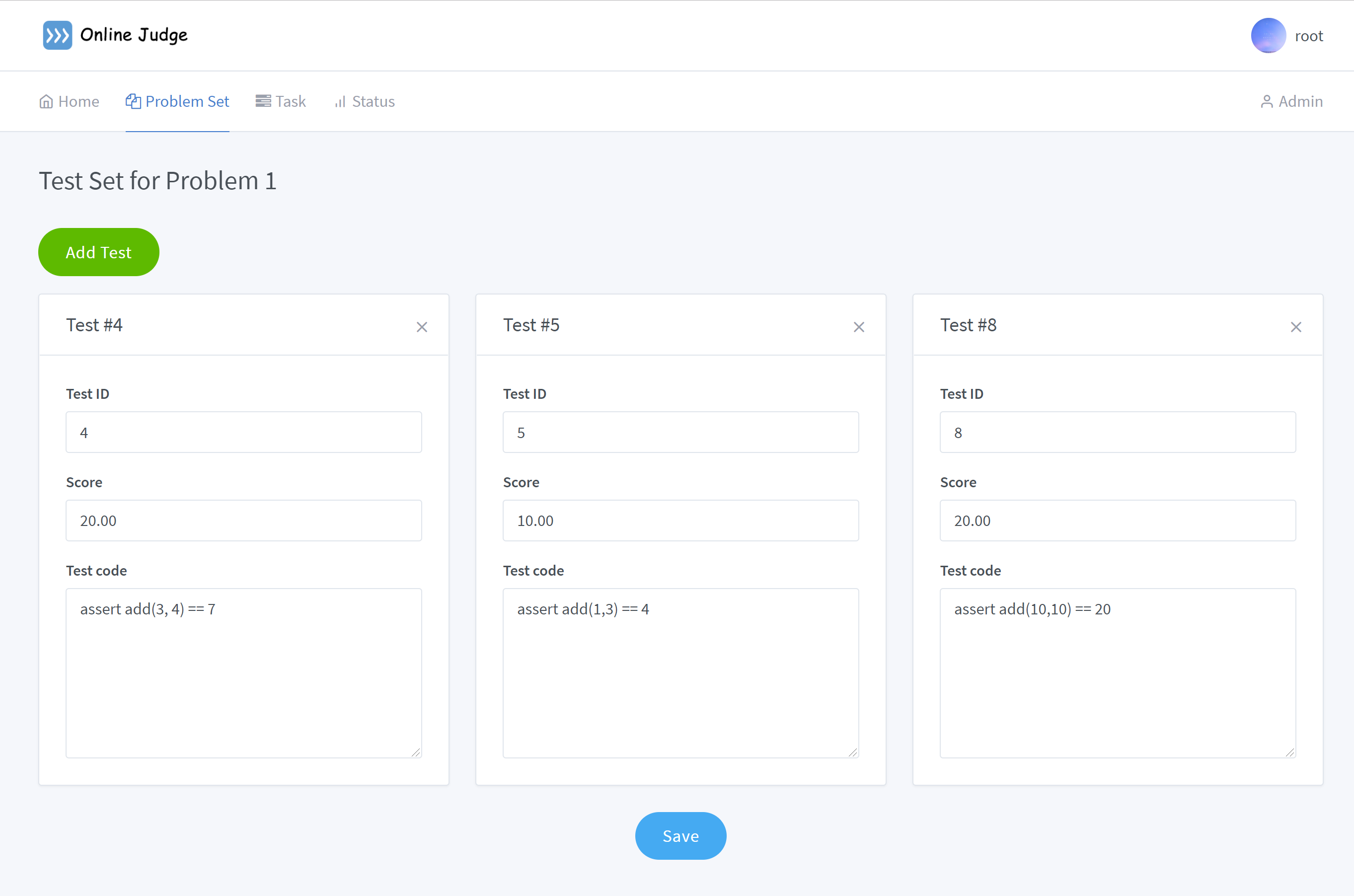
*Figure 4 Problem page*

For each problem, there will be a title and a description (no sample input or output). To the right part of this page, there are information, such as tags, level and problem id. User can submit their own solution many times for one problem. After submission, system will run the test code for the submitted code and give a score back. Teachers can also change the description and the official solution of problems and adjust the test code for a problem (It will be mentioned in 5.5). Problems may be included in a task for a group of users to finish (It will be mentioned in 5.3).



*Figure 5 Problem edit*

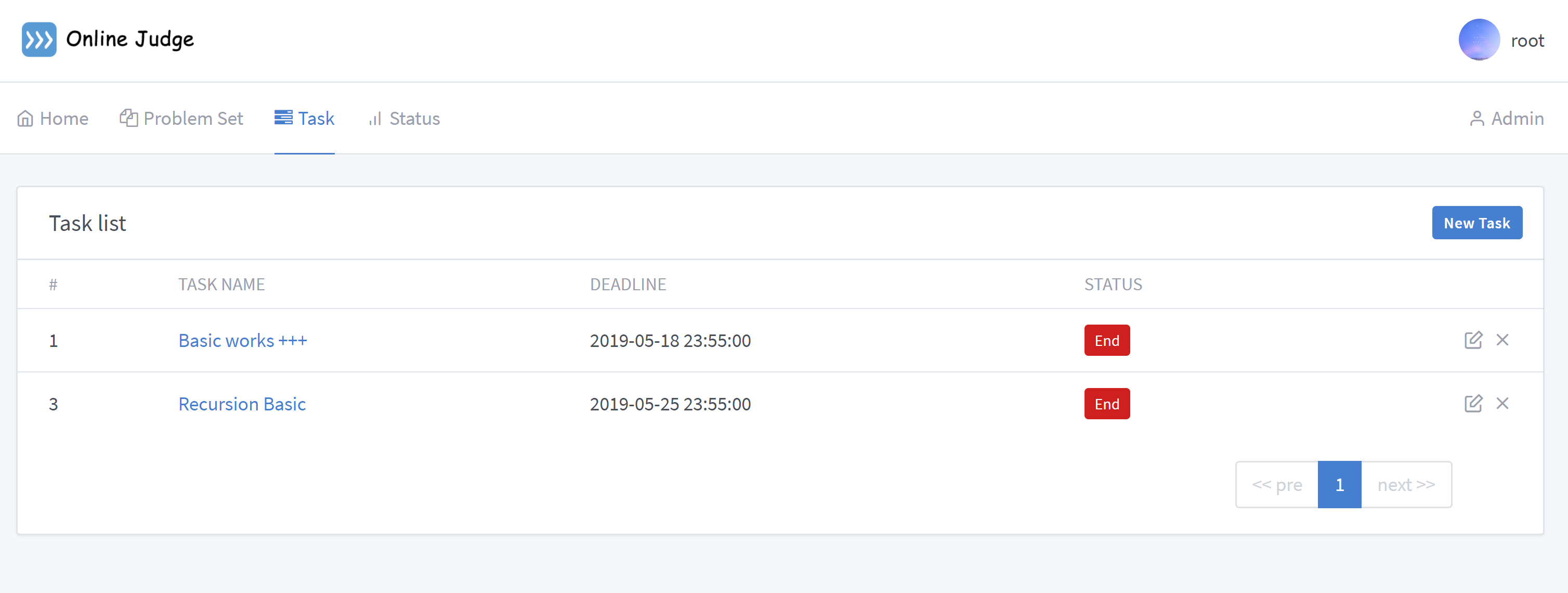
This is a page that can be accessed by clicking the edit button at the right of any problem. You can modify the title of the problem, the description, modify the difficulty, or change tags of the problem. Markdown language is supported for the description of the problem.



*Figure 6 Test page*

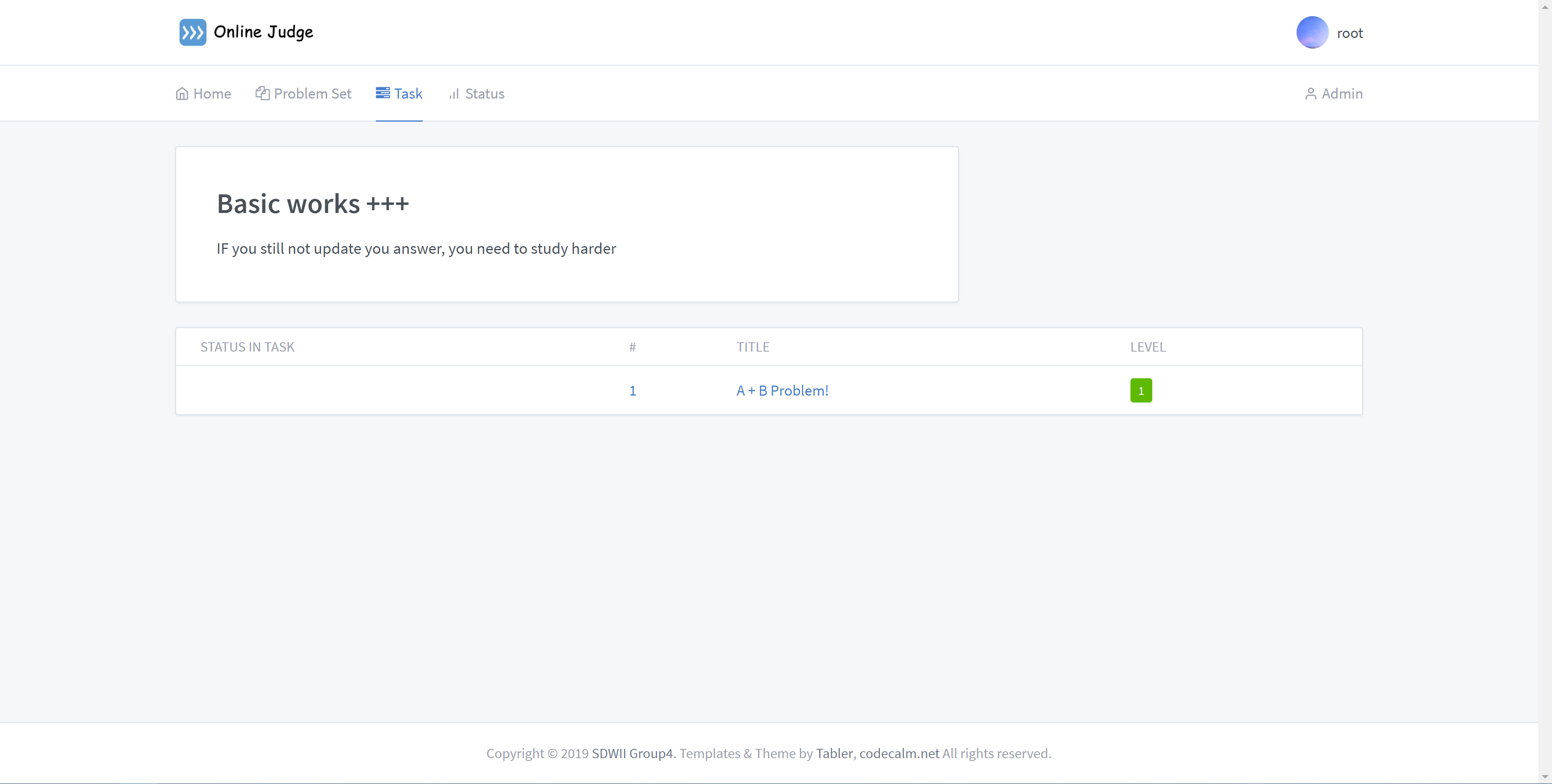
This is a test set page. When the teacher creates a problem, the test set corresponding to the problem should be added. In this page, the teacher can view the tests currently set for the problem and add or delete tests. These tests will be used to verify that student's submitted code can produce right answers, then score each submission.

## Task



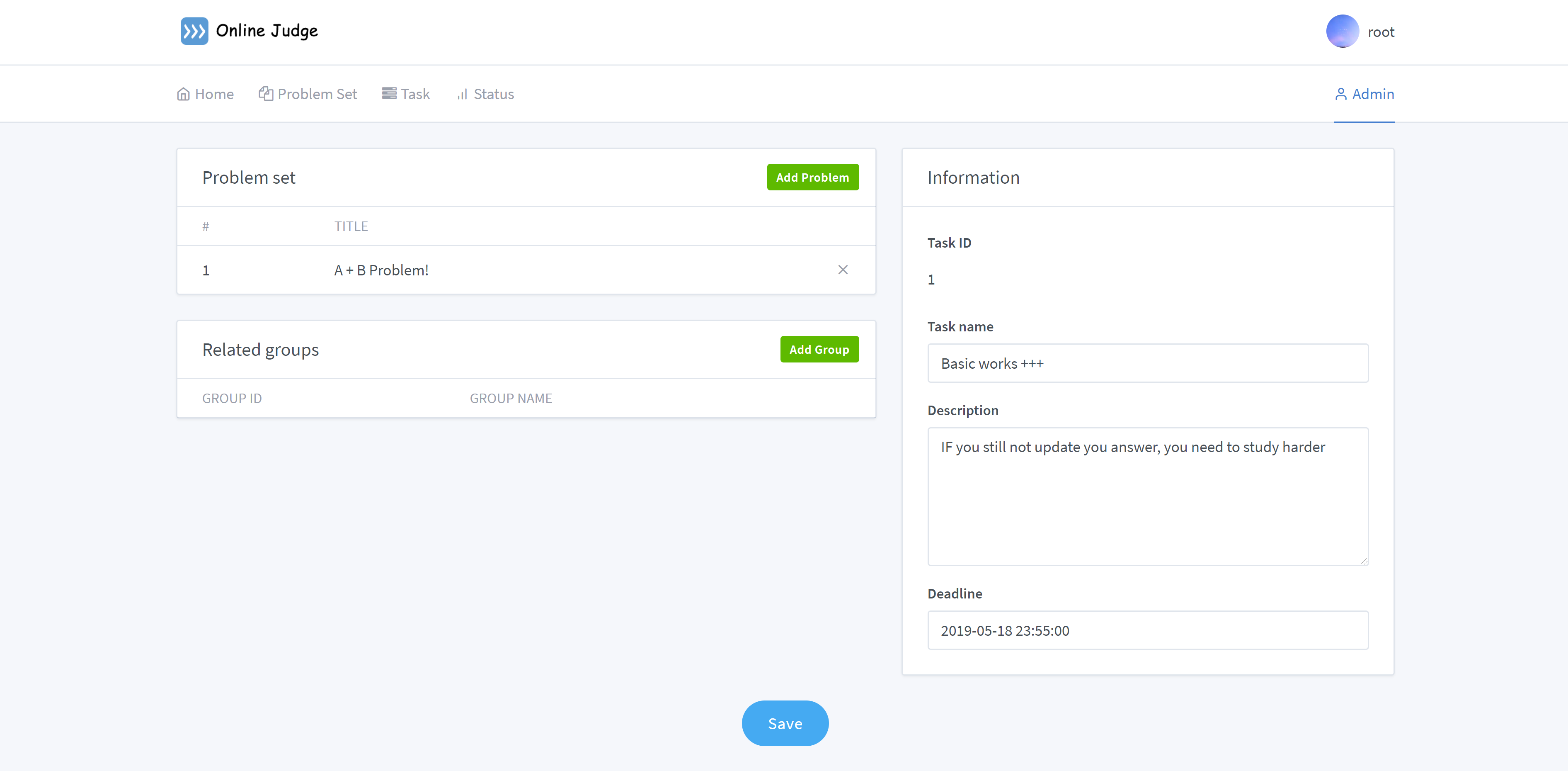
*Figure 7 Task page*

This page is a Task page. There is a table for students to get all the tasks that they need to finish. And students can click into one of the tasks and get the details, including all problems related to the task. Then student can solve the problems in the task. There will be DDL for each task, and each student is required to submit the answer to each question in the task before DDL. If the submission is submitted after DDL, the score will be zero. Students of each group can only see the tasks assigned to their group (See 5.5 for the definition of group).



*Figure 8 Problem in the Task*

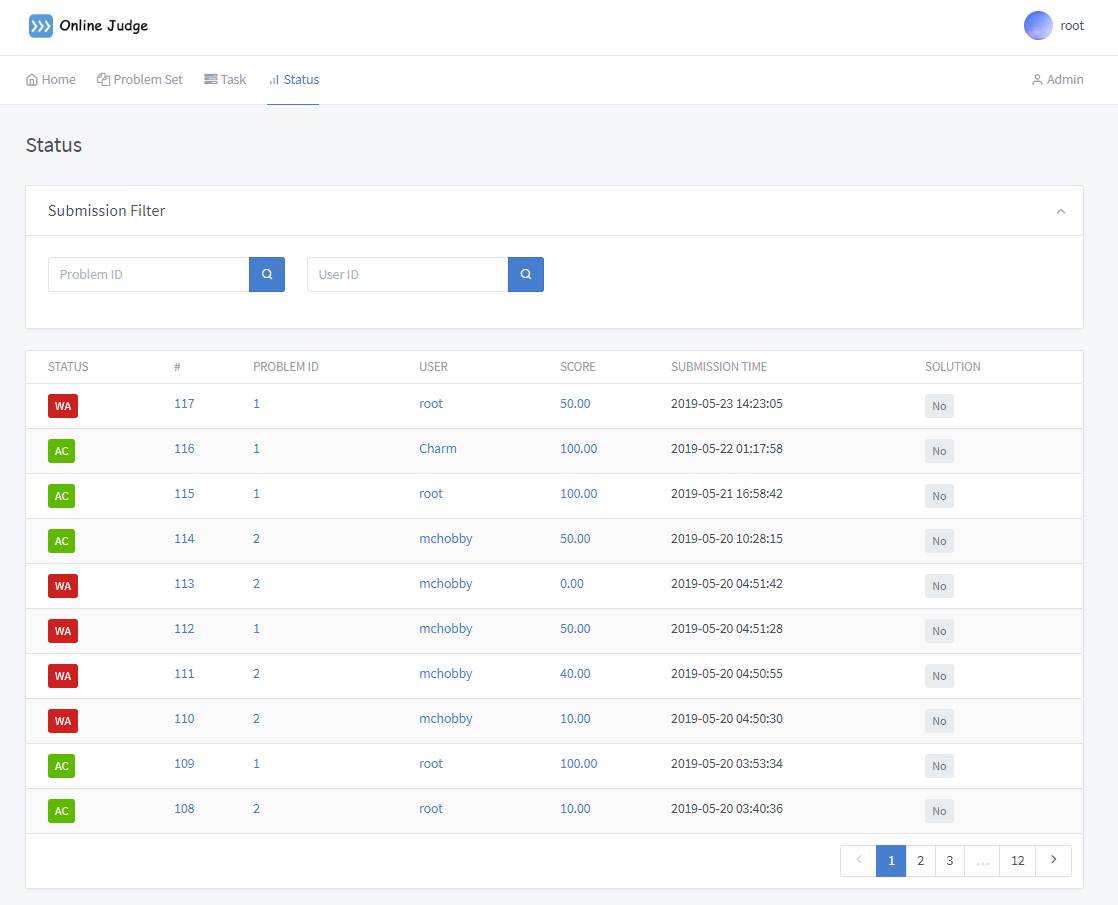
This is a task-problem page. In last page, when you click a task, the browser will jump into this page. In this page, you will find the description of task. And this description is filled and edited by teachers. Under the description, you can find the problems that this task contains. And the problems’ information like problem ID, title and level.



*Figure 9 Task edit page*

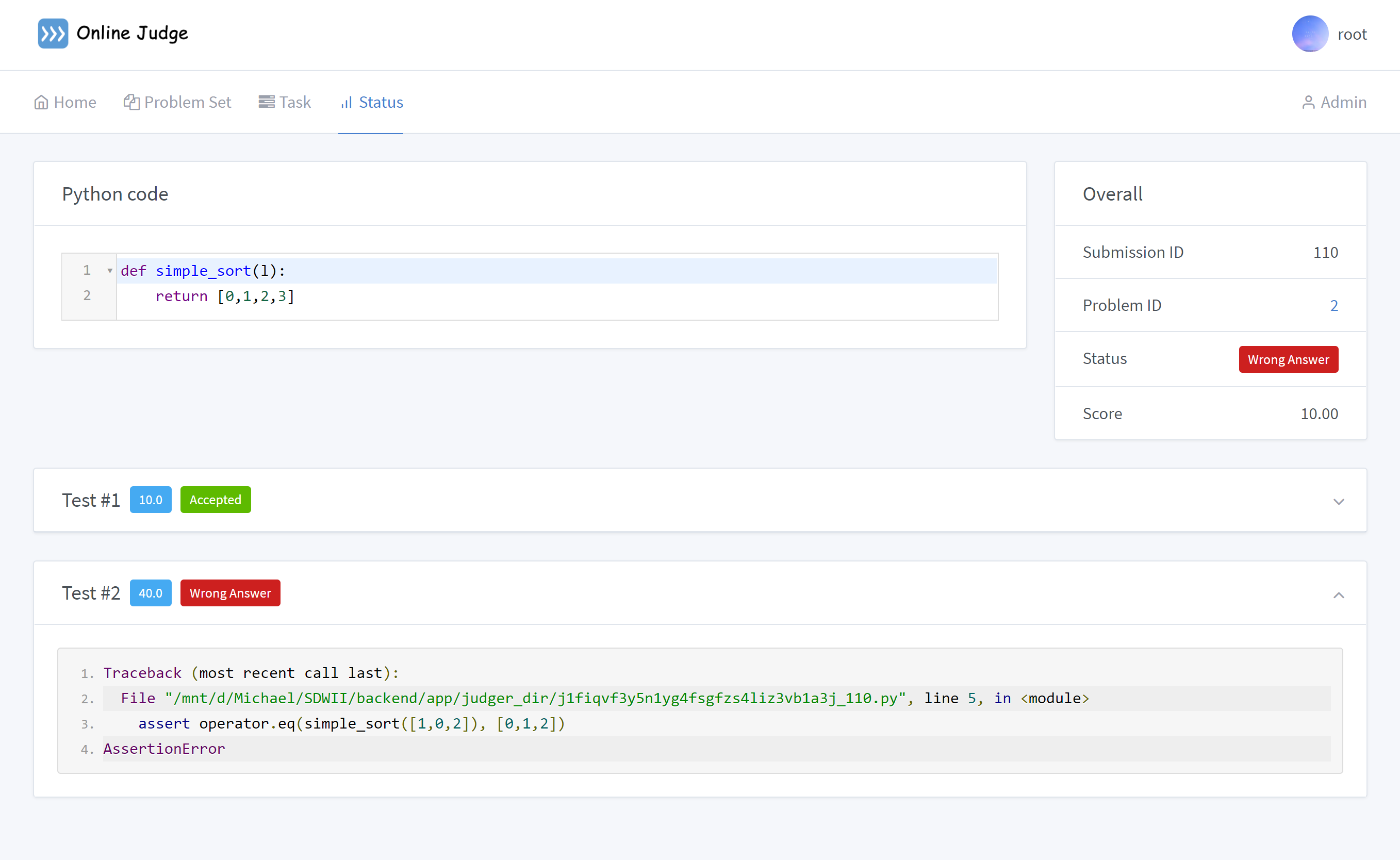
This is a page that is used to view the problem set and related groups of a task. In left part, you can see a problem list that need to be done. Due to different groups can be distributed to different tasks, so the related groups is used to view that. In right part, some information can be viewed. It contains task’s ID, task’s name, the description and deadline of the task.

## Submissions & Status



*Figure 10 Status page*

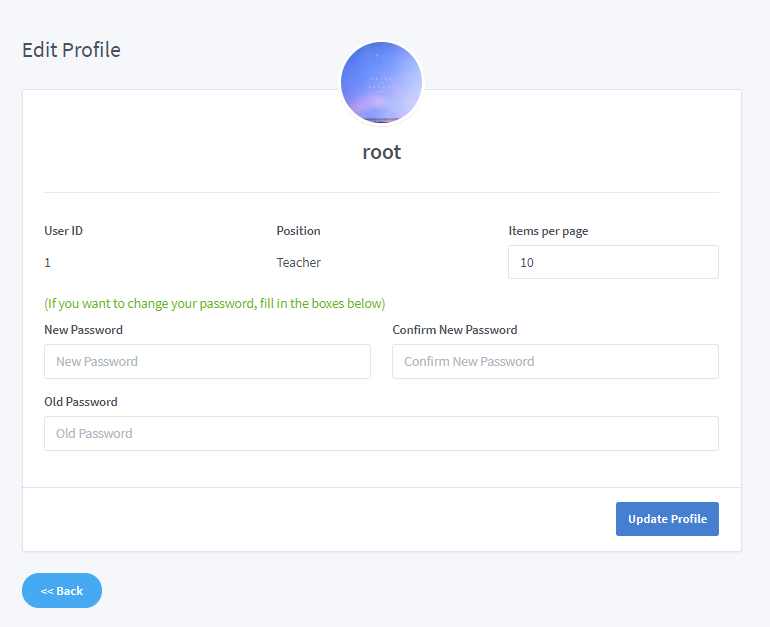
This is the status page. Users can see all submissions in the system. To see the detail of a submission, click the status tag, submission ID or the score. Teachers are allowed to view the details of all submissions. Students are only allowed to view the details of their own submissions. Problem ID filter and User ID filter are also available.



*Figure 11 Submission result page*

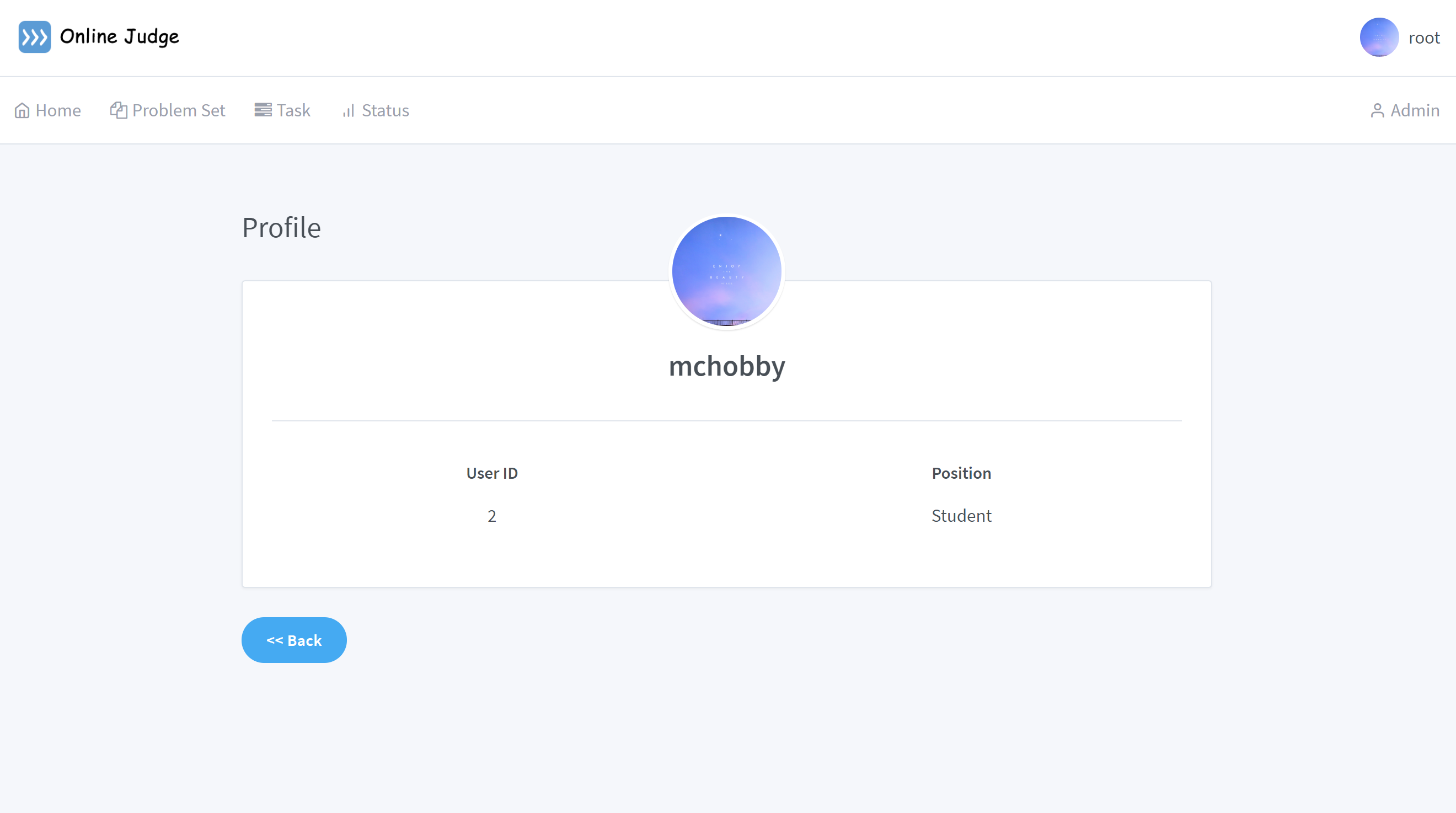
This is the result page. In this interface, you can see the code that needs to be tested. And the test results for the code. You can check which tests did not pass. In the upper right corner of the interface, you can see an overall panel. It is the overall result of this test, you can see the test status of the problem and the total score.

## User profile



*Figure 12 Edit Profile page*

This is a edit profile page. You can change your information here. But when you edit password, you need confirm your new password and also fill your old password. Some information cannot be changed, such as the ID and your position.



*Figure 13* *Profile page*

This is a profile page. In this page, users can view the information of other users, such as users’ ID and name.

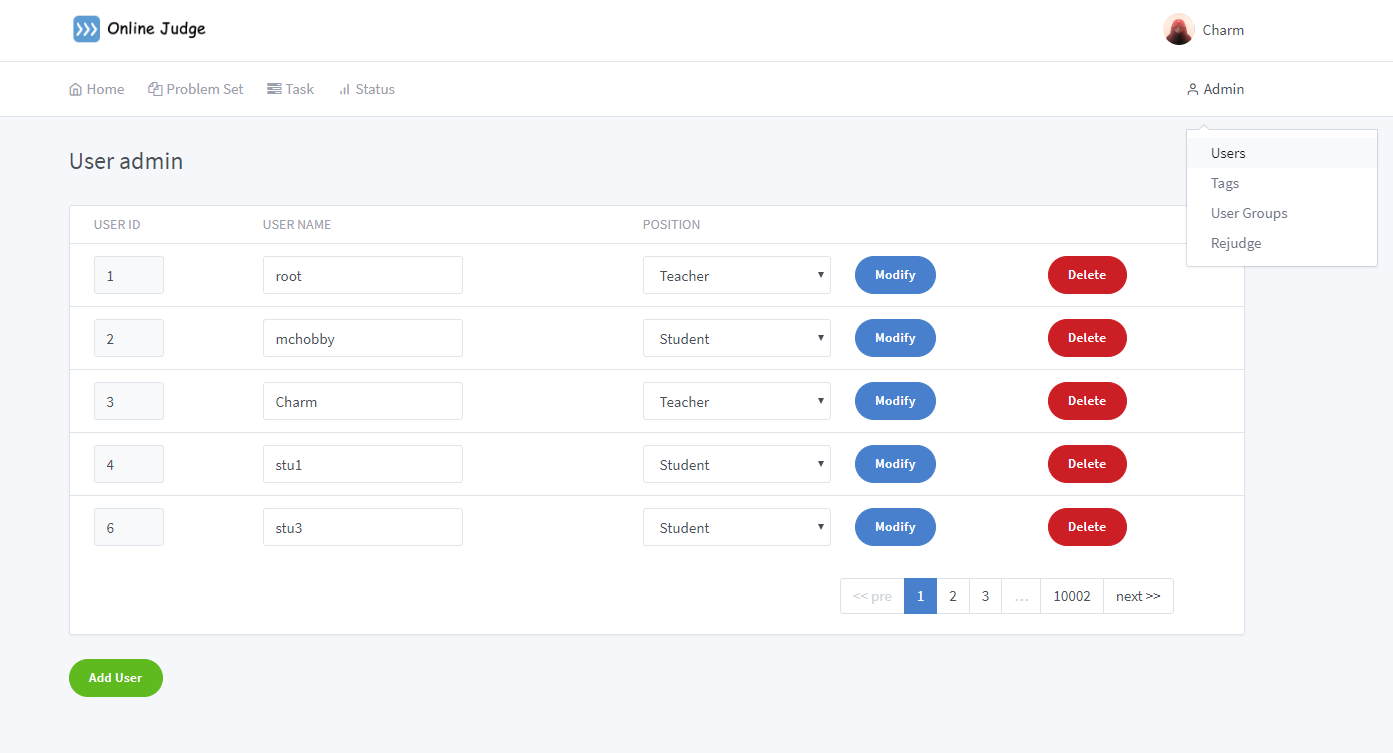
## Admin Panel

The admin panel allows teachers to modify the system. When using the teacher’s account to login, there will be an admin panel appearing in the navigation bar.

Teachers are allowed to:

* Add, modify and delete problems
* Set submissions as the solution for a problem
* Modify test set for a problem (by adding or deleting tests from the test set)
* Create new task and set DDL for a group of students
* Manage group members
* View existing members
* Add, modify, delete tags
* Update test code
* Add and delete users

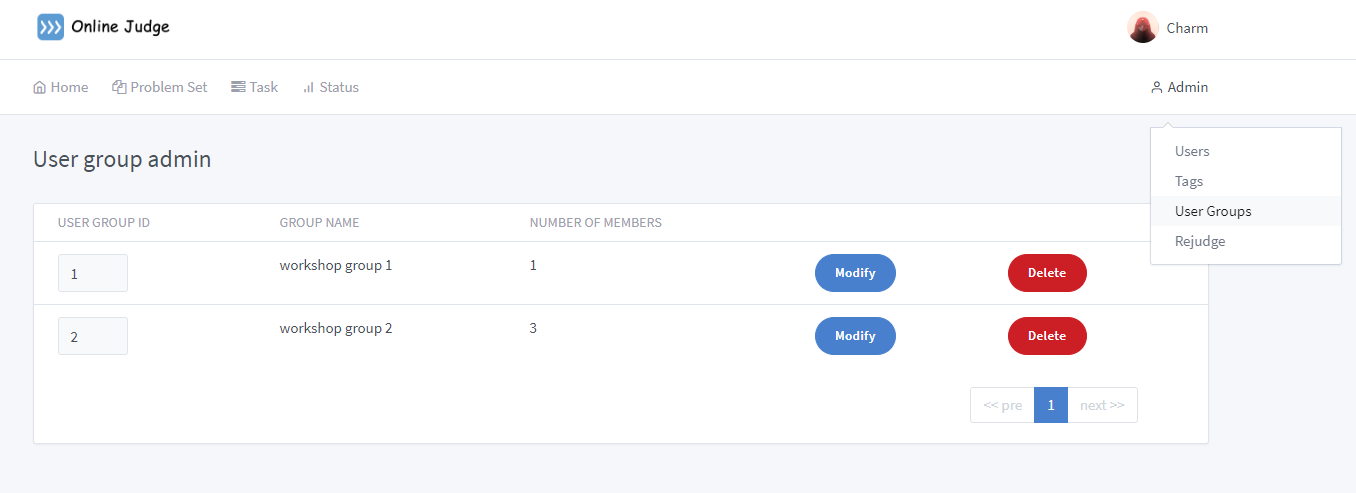
Admin User page:



*Figure 14* *User admin page*

This is a user page that only the teachers can see. The teacher can change the name of the user, change the position of the user, or delete users.

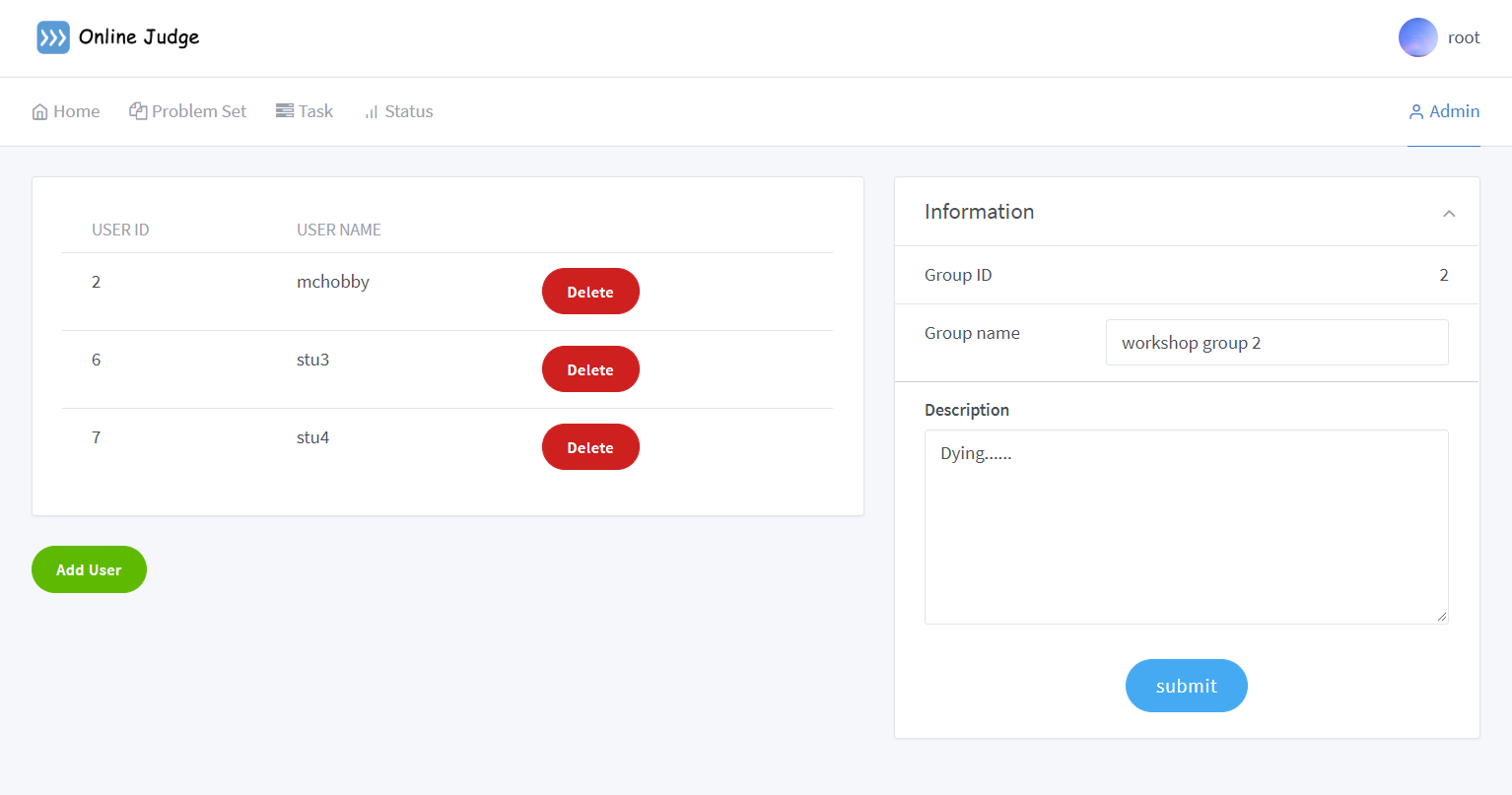
Admin User group page:



*Figure 15* *User group admin page*

This is a user group page that only the teachers can see. Teachers can modify the user group, for example, the teacher can add or delete the students in the group, and the teacher can change the group name or change the description of the group. The teacher can also delete the group that don’t need any more.

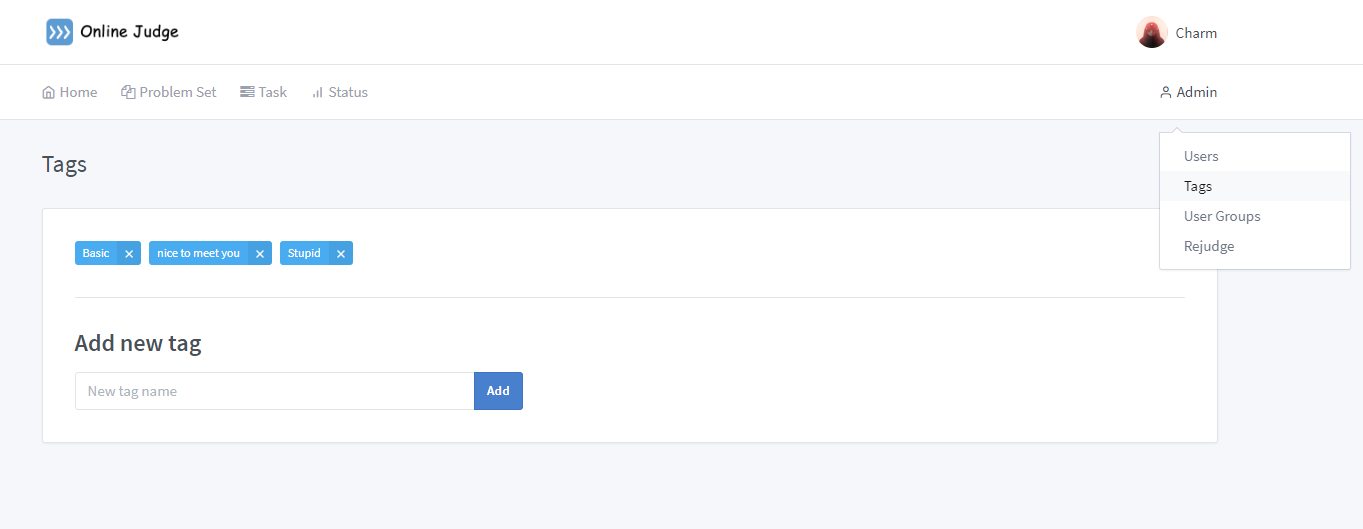
User group edit page:



*Figure 16* *User group edit page*

This is a page for teachers to modify the user group, including group name, group description and group members.

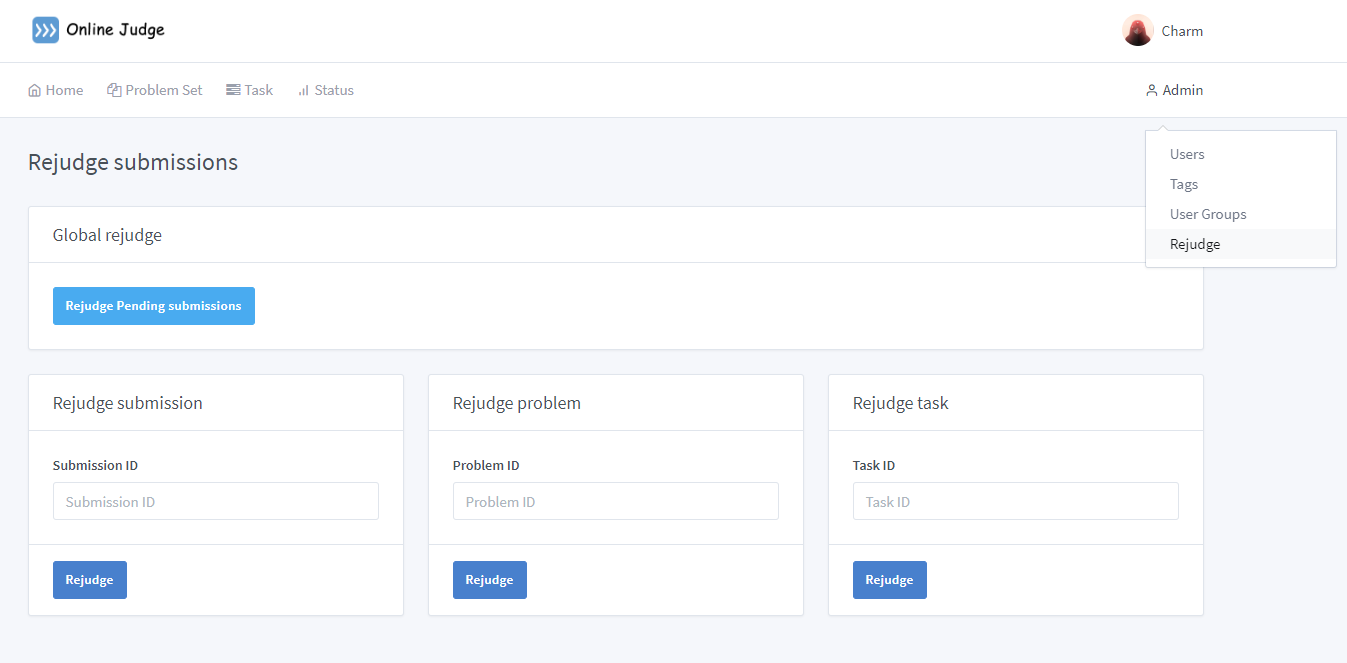
Admin tags page:



*Figure 17* *Tags edit page*

This is a tag page that only the teacher can see. The teacher can add some new tags, and he can also change the name of the tags that we have now. If some tags are not needed any more, the teacher can delete them.

Re-judge page:



*Figure 18* *Rejudge page*

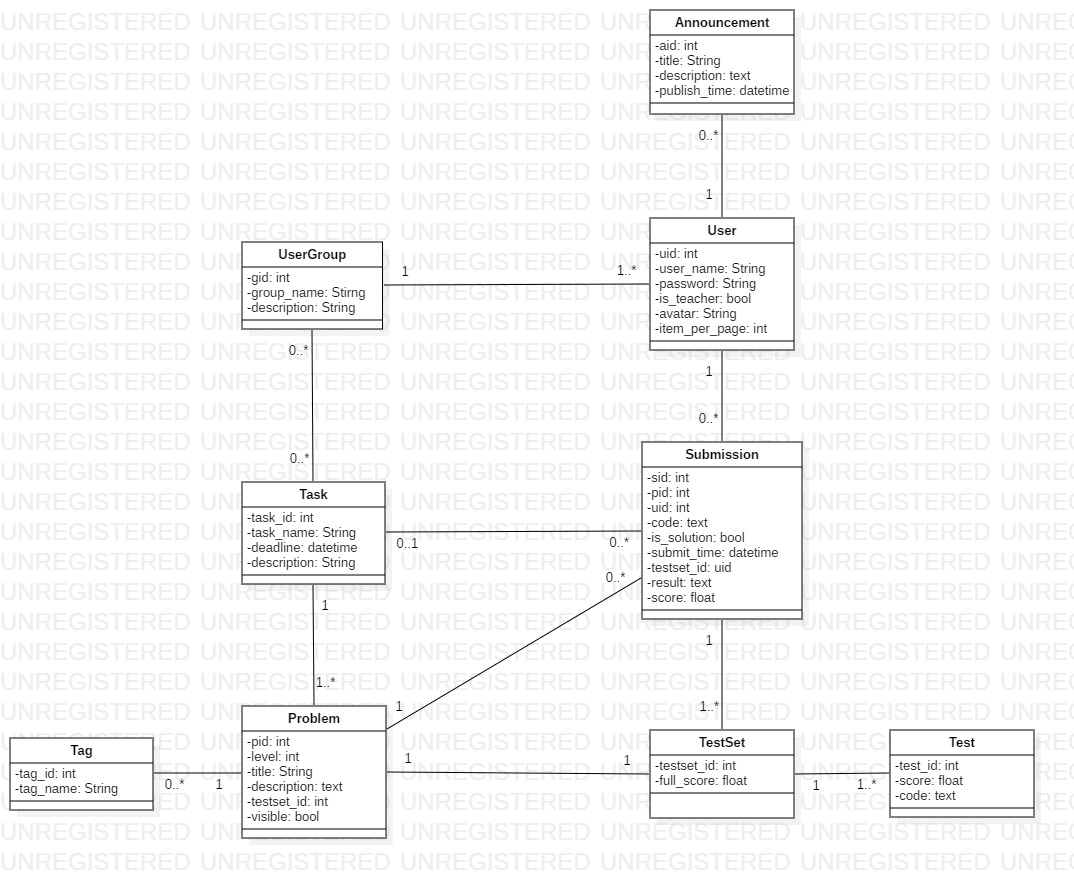
This is the re-judge page that only the teacher can see. After the teacher change some test code of some problems, he can get into this page and re-judge the problem that he changed.

1. Database Design

The E-R diagram is shown below.

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描述已自动生成

1. Diagrams