

## Design and Implementation of Internet Applications– 2016-2017

Final Test

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Notes: Students can use one (1) handwritten sheet of paper, no printed copied are allowed. The test has a duration of 1h30.

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[10 val.] **Q-1** Consider a task manager application to allow users to be organized in teams, to manage a shared backlog, to assign a task to a member, and change the status of a task. The application is specified by the following user stories:

1. An anonymous user, can sign up in the system, and see his personal details, as a registered user.
2. An anonymous user, can log in the system, and see a list of assigned tasks.
3. A registered user, can access the application, and see the list of assigned tasks.
4. A registered user, can create a team, and see its empty backlog.
- ⇒ 5. A registered user as owner of a team, can invite registered users to his team, as members.
6. A registered user, can add a task to the backlog of a team.
- ⇒ 7. A registered user, can see the list of tasks in the backlog of a team.
8. A registered user, can assign a task in the backlog to some members of the team.
9. A registered user, can mark one of tasks assigned to him as completed.
10. A registered user, as owner of a team, can mark tasks in the team's backlog as completed.

A task is further described by a small text and a due date. All lists of tasks can be filtered by date and completion status. **Note** that the list of tasks of a user includes tasks from different teams.

This question is about the definition of a service based application, using the REST architectural style, Java Spring and JPA.

- a) [4 val.] **Define** the necessary resources, operations, and parameters that are needed to (strictly) implement the user stories above. State the essential URLs, method (GET, POST, etc.), parameters, and example response (e.g. JSON).
- b) [6 val.] **Define** the data model of the application using JPA annotations and a set of classes. Be sure to **represent** the relations between entities with JPA relation annotations. It is not necessary to list getters and setters.

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[5 val.] Q-2 This question is about the implementation of business logic in an application as the one described in Q-1.

- a) [3 val.] **Define and implement** controller methods for user stories 5 and 7. **Declare** the method annotations, signatures, and code. **Define and implement** auxiliary services and repository methods to achieve the best possible solution in terms of correctness, efficiency, and modularity.
- b) [2 val.] **Define** a repository method to support a controller method implementing user story 3. Provide the best possible solution in terms of correctness and efficiency.

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[5 val.] Q-3 This question is about the implementation of security policies at the level of a service based application.

- a) [1 val.] **Compare** the following security models:

- the standard Role-based access control model in the development of service-based applications,
- the actual Spring role implementation, and
- the data dependent model based access control presented in the course lectures.

- b) [4 val.] **Define** the controller methods' signatures and security annotations for the user stories 5, 7, 8, and 10 in Q-1. **Define and implement** auxiliary services to implement data dependent access policies.