CS545: Web Application Architecture
Midterm Exam

Computer Professionals Program

Date: 11 - 08 -2022

Theory		Cognitive skills		
Q1 (4)	Q2 (3)	Q3-P1 (8)	Q3-P2 (12)	Q3-P3 (3)

The exam takes 150 minutes, No extension.

Please read the exam policy before you start the exam.

Do not provide more than one answer to a question. If you do so only the first one will be evaluated.

There is no tolerance policy for academic dishonesty on exams. You will be asked to leave the exam room immediately without a warning if you do or violate one of the following things which means you will get an NC.

1. You are caught cheating or trying to cheat.
2. Answers should be written with a pen or pencil, but if you want to use a pencil, please bring your own eraser and sharpener you are not allowed to borrow from other students during the exam.
3. All mobile phones should be turned off and stored with your coat or backpack. You could also place it on the instructor's desk.
4. You are not allowed to go to the restroom or go out to the room for water.
5. You are not allowed to ask or get extra papers from other students.

Question 1: Circle the correct answer   (4 points – each 1)

1) What is the suitable component stereotype annotation to place on classes that will be functioning in the data layer.

```
a) @service              b) @controller
c) @repository           d) @bean
```

2) Which versioning type (REST) is the following URI implementing:
```
      example.com/users?version=1
```

```
a) URI versioning            b) Parameter versioning
c) Custom-header versioning   d) Mediatype-header versioning
```

3) A _____ is a predicate that refers to a collection of join points that specify where advice to be applied.

```
a) Pointcut              b) Advice
c) Joint point           d) Annotation
```

4) According to Richardson's maturity model for RESTful services, the following URI satisfies 'level 2'
➔ **GET --** `example.com/users/1`

```
a) true                  b) false
```

Question 2: Short Answers   (3 points – each 1.5)

1) What is auto wiring (injecting) and list the different modes of it?

2) List two REST architectural constraints with a brief explanation?

Question 3)
Part-1
Create and annotate the domains based on the database tables given below, considering the following: **(8 points)**

- A **Student** can only have one **Address**
- An **Address** can have one or more **Students**
- A **Student** can take one or more **Courses**
- A **Course** can have one or more **Students**
- A **Course** can have one **Course_Details** and vice versa**.**

    o All associations should be bi-directional
    o All primary keys should be auto-generated except the **Course**
    o Set JPA cascade operations as follows:
        ▪ Deleting a **Course** should remove its **Course_Details**
        ▪ When retrieving a **Student/s,** it should not load all of its associations unless required.

Student

student_id	name	gpa	address_id
111	Dean	3.5	1
112	Zaineh	3.8	1
113	Yasmeen	3.9	2

Address

address_id	city	state	zipcode
1	Fairfield	IA	52556
2	Iowa City	IA	52440
3	Morrison	IL	61270

Course

course_id	name
545	Web Application Architecture
221	Data Structures
105	Problem Solving in CS
401	Modern Programming Practices

Student_Course

student_id	course_id
111	545
111	221
112	545
112	401
113	221
113	105
113	401

Course_Details

description_id	course_description	credit	program	last_updated	course_id
1	This course covers web …	4	MSC	2021	545
2	In this course, the fundamentals …	4	BSC	2020	221
3	This course focuses on teaching...	4	BSC	2018	105
4	This course covers the basic …	4	MSC	2016	401

Part-2
Create RESTful web services for the <u>Student</u> domain by following the n-tier architecture and implement the following requirements with best practices : (12 points)

- Implement CRUD operations – (findAll, findById, deleteById, save, update)
- Create an endpoint that returns the **Courses** for a specific **Student**
- Create an endpoint that returns the **Students** that have a **Gpa** less or equal than a given value.
- Create an endpoint that will retrieve all students that are taking at least one course from the 'MSC' program and his/her Gpa is less than a given value.

Note: You may focus on the Controller and Repository implementations. You may add anything specific in the service layer if you are willing to add some business logic other than the usual service calls.

Note: If you need anything from the Course domain, you may assume the courseService is completely functional according to your requirement. Just add an assumption.

Part-3
Create an Aspect class that will send a notification after any method that returns a List<Student> in the Student Controller. You may use the following implementation for the advice.   (3 points)

```
public void sendAlert( Jointpoint joinpoint ){
     // implementation to send alert …
}
```

Note: You do not have to fill out the implementation to send alert… *. Assume it will do the required functionality.*