Student Name:-_____ Student ID: _____

# CS545: Web Application Architecture
# Midterm Exam

## Computer Professionals Program

**Date: 04 - 05 -2022**

| Theory | | Cognitive skills | | |
|---|---|---|---|---|
| Q1 (4) | Q2 (4) | Q3-P1 (8) | Q3-P2 (10) | Q3-P3 (4) |
| | | | | |

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 business logic layer.**

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

**2) Which versioning type (REST) is the following URI implementing:**
```
        example.com/v1/users/1
```

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

**3) Advice that runs before a join point but that does not have the ability to prevent execution flow proceeding to the join point (unless it throws an exception).**

```
a) @Before                        b) @After
c) @Afterthrowing              d) @Around
```

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

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

## Question 2: Short Answers                                  (4 points – each 2)

**1) What is the purpose of applying the 3-tier architecture?**

**2) List the states of the entity life cycle in JPA 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**
- A **Student** can take one or more **Courses**
- A **Course** can have one or more **Students**
- A **Course** can contain multiple **Subjects**
- A **Subject** can be under one **Course**
- All associations should be bi-derectional
- All primary keys should be auto-generated
- Set JPA cascade operations as follows:
    - All operations applied on **Student** should be propagated to **Address**
    - Deleting a **Course** should remove all its **Subjects**

## Student

| student_id | name | gpa |
|---|---|---|
| 111 | Dean | 3.5 |
| 112 | Zaineh | 3.8 |
| 113 | Yasmeen | 3.9 |

## Address

| address_id | city | state | zipcode | student_id |
|---|---|---|---|---|
| 1 | Fairfield | IA | 52556 | 111 |
| 2 | Iowa City | IA | 52440 | 112 |
| 3 | Morrison | IL | 61270 | 113 |

## Course

| course_id | name |
|---|---|
| CS545 | Web Application Architecture |
| CS221 | Data Structures |
| CS105 | Problem Solving in CS |
| CS401 | Modern Programming Practices |

## Student_Course

| student_id | course_id |
|---|---|
| 111 | CS545 |
| 111 | CS221 |
| 112 | CS545 |
| 112 | CS401 |
| 113 | CS221 |
| 113 | CS105 |
| 113 | CS401 |

## Subject

| subject_id | topic | course_id |
|---|---|---|
| 1 | Restful services | CS545 |
| 2 | Spring boot | CS545 |
| 3 | Hibernate | CS545 |
| 4 | List – ADT | CS221 |
| 5 | Map – ADT | CS221 |
| 6 | Designing Algorithms | CS105 |
| 7 | Inheritance | CS401 |
| 8 | Associations | CS401 |

**Part-2**
**Create RESTful web services for the <u>Student</u> domain by following the n-tier architecture and implement the following requirements:** **(10 points)**

- Implement CRUD operations
- Create an endpoint that returns the **Courses** for a specific **Student**
- Create an endpoint that returns the **Students** that have a <u>Gpa</u> greater than or equal to a given value.

*Note: You may focus on the Controller and Repository implementations*

**Part-3**
**Create an Aspect class that will have an annotation called @Alert that will send a notification after any write method (create, delete, and update) on the Student Controller. You may use the following implementation for the advice.** **(4 points)**

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