

Student Name:- _____ Student ID: _____



CS545: Web Application Architecture
Midterm Exam

Computer Professionals Program

Date: 04 - 11 -2023

Theory		Cognitive skills		
Q1 (5)	Q2 (4)	Q3-P1 (9)	Q3-P2 (14)	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

(5 points – each 1)

1) What is the suitable component stereotype annotation to place on classes that will be implementing business logic aspects.

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

2) Which of the following operations is not idempotent?

- a) GET
- b) POST
- c) PUT
- d) DELETE

3) To get the value of id in the URL below:

`http://localhost:8080/products?id=1234`

```
@GetMapping("/products")
public List<Product> findProductById ( ??????????? ) {
    return productService.findProductById(id); }
```

- a) @ModelAttribute("id") long id
- b) @PathVariable("id") long id
- c) @RequestParam("id") long id
- d) @RequestBody("id") long id

4) Advice to be executed after a join point completes without throwing an exception.

- a) AfterReturning
- b) Advice
- c) AfterThrowing
- d) Before

5) If the cascade type was `CascadeType.ALL` that propagates from a parent to a child entity. When we delete the 'parent' entity, the associated entity 'child' will also be deleted.

- a) true
- b) false

Question 2: Short Answers

(4 points – each 2)

1) Differentiate between Spring and SpringBoot.

2) In the ORM entity life cycle. What is the difference between 'detach' and 'remove'. Write your answer with a brief explanation.

Question 3)

Part-1

Create and annotate the domains based on the database tables given below, considering the following: (9 points)

- A **Book** can be under one **Category**.
 - A **Category** can have one or more **Book/s**.
 - A **Book** can have one or more **Author/s** and vice versa.
 - An **Author** can have one **Address** and vice versa.
- All associations should be bi-directional
 - All primary keys should be auto generated.
 - Set JPA cascade operations as follows:
 - Any operation applied to the **Author** should also apply to the **Address**
 - When retrieving a **Book**, it should not load all of its associations unless required.
 - When fetching **books**, avoid allowing the (N+1 problem) from occurring.
- (Bonus)

Book

<u>isbn</u>	title	price	<u>category_id</u>
111	Designing Web Services	40	1
112	Algo. Problem Solving	35	1
113	How to be Happy	60	2
114	Basics of sketching	15	3

Category

<u>category_id</u>	name
1	IT
2	Philosophy
3	Arts

Author

<u>author_id</u>	name	<u>address_id</u>
1	Zaineh	4
2	Yasmeen	2
3	Mira	1
4	Dean	3
5	Shaima	5

Book_Author

<u>isbn</u>	<u>author_id</u>
111	4
112	4
112	5
113	2
113	3
114	1

Address

<u>address_id</u>	country	city	state	zipcode
1	United States	Orlando	FL	14565
2	United States	Fairfield	IA	52556
3	United States	Orlando	FL	32832
4	Jordan	Karak	-	11234
5	Jordan	Amman	-	34525

Part-2

Create RESTful web services for the **Book** domain by following the n-tier architecture and implement the following requirements with best practices: (14 points)

- Implement CRUD operations – (findAll, findById, deleteById, save, update).
- Create an endpoint that returns the **Authors** for a specific **Books**.
For example: api/v1/books/112/authors → Output: authors 4 and 5
- Create an endpoint that will retrieve all **Books** that equal the number of authors based on a given number 'numAuthors'.
For example: numAuthors = 1 → Output: books 111 and 114
- Create an endpoint that will retrieve all **Books** that have at least one author from a specific **country** and under a specific **category**.
For example: country = 'Jordan' and category = 'IT' → Output: book 112
- Create an endpoint that will search all **Books** based on the following criteria: (% title % , >= price). It must satisfy according to given criteria (AND). The returned value should be a list of books.

***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 Author domain, you may assume the authorService is completely functional according to your requirement. Just add an assumption.*

Part-3

Create an Aspect class that will log any method call from the BookController. You may use the following implementation for the advice.

(3 points)

```
public void log( Joinpoint joinpoint ){  
    // implementation to log ...  
}
```
