National University of Computer and Emerging Sciences
Karachi Campus

Software Construction & Development (SE3001)

Final Exam

Date: Dec 26th 2024

Course Instructor(s)

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Total Time (Hours):	**03**
Total Marks:	**50**
Total Questions:	**08**

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Attempt all the questions.

CLO 01: Implement software design patterns as a part of software construction activity.

Q1: Answer the Following Question. (Max 3-4 Sentences) **[Marks: 10]**

1. Describe the process by which the logical view name is converted into the physical view location in Spring MVC.
2. In which step is the physical location of the view determined in the Spring MVC request-handling process?
3. How does the entire Spring Web-MVC architecture ensure separation of concerns between the Controller, View, and Model layers?
4. Explain how the DispatcherServlet uses the model data returned by the Controller to dynamically render views based on the client request type (e.g., HTML, JSON, XML).
5. If the View Resolver is configured incorrectly, what types of errors might occur, and how would you debug such issues?
6. Explain the lifecycle of a request in Spring MVC, starting from the client request until the response is sent back. How do different components work together to ensure modularity?
7. How does Spring MVC ensure that multiple user requests are processed independently without interfering with each other's data in the Model object?
8. What are the advantages of using a View Resolver instead of hardcoding the physical view location in the Controller logic? Discuss in terms of maintainability and scalability.
9. What would happen if the Handler Mapping fails to find a suitable mapping for an incoming request? How can this scenario be handled gracefully?
10. How does the Model object facilitate data transfer between the Controller and the View?

CLO 03: Design test cases for a software system.

Q2: Answer the Following Question **[Marks: 05]**

You are developing a desktop application using Java Swing to manage student records for a university. The application connects to a MySQL database to perform various operations such as adding new students, updating existing student information, deleting student records, and retrieving student details. Identify and explain the different types of exceptions that can occur in this Swing application during its database operations. How many distinct exceptions can you anticipate, and what are the potential causes for each?

CLO 01: Apply software engineering concepts to construct (i.e. design, develop, and test) software in team setting.

Q3: Answer the Following Question. **[Marks: 05]**

1. Draw the Spring Boot Flow architecture.
2. Write the steps how the request is processed in Spring web MVC architecture.

CLO 02: Implement software design patterns as a part of software construction activity

Q4: Answer the Following Questions (Max 3-4 Sentences) **[Marks: 10]**

1. Which provides better support for dynamic content rendering, JSP or Thymeleaf? Why?
2. Discuss the differences in integrating conditional statements and loops in JSP versus Thymeleaf. How do JSP and Thymeleaf handle server-side rendering differently? Provide an example to explain.
3. Which is more flexible for executing highly optimized or custom queries: JPA or JDBC? Why?
4. Which is more flexible for executing Complex queries: JPA or JDBC? Why?
5. How can you define a bean in XML, Java-based configuration, and using annotations? Provide an example for each.
6. What are the implications of using JPA's caching mechanism compared to JDBC's direct database access?
7. Explain the lifecycle of a Spring Bean, starting from instantiation to destruction. What are the key lifecycle methods involved?
8. How does Spring handle dependency injection during the lifecycle of a bean? What happens if a dependency is missing?
9. Compare the different types of Spring configuration metadata. Which is more suitable for modern applications and why?
10. What role does the BeanFactory play in the lifecycle of a Spring Bean? How does it differ from ApplicationContext?

CLO 04: Use a version control system as a part of software construction activity.

Q5: Read the scenario and answer the below Questions. **[Marks: 05]**

A mid-sized e-commerce platform was initially built using plain **Servlets** for both business logic and rendering dynamic web pages. The system worked fine during the early stages with limited features. Over time, as the business expanded, the application faced the following challenges:

1. **Performance Bottlenecks:** The Servlets are overloaded with rendering large HTML pages and handling complex business logic.
2. **Scalability Issues:** The platform needs to support multi-language and multi-regional content rendering, which is difficult to manage with Servlets alone.
3. **Maintenance Overhead:** Developers spend significant time debugging interwoven HTML and Java code in Servlets.
4. **Poor User Experience:** Limited support for modern UI frameworks and responsive design.

The company has decided to migrate the application to an **MVC architecture** using **JSP-Servlet**. However, during the migration process, the following additional concerns arise:

- The database query layer is tightly coupled with the Servlets, making it difficult to move the logic to a controller.
- There are numerous custom tags and helper functions written directly in Java for UI rendering, which now need to be refactored for JSP compatibility.

- Error handling is inconsistent, and the migration team is unsure how to implement centralized error handling in the new architecture.

Question:

Based on the scenario:

1. What steps should the development team take to separate database logic from Servlets while ensuring minimal disruption to the application's functionality?
2. How can the team refactor existing custom tags and helper functions to align with JSP's tag library approach?
3. Propose a solution for implementing error handling in the new architecture.
4. What modern tools or frameworks can the team leverage to address the challenges?
5. Identify potential risks during the migration process and how they can be mitigated.

CLO 05: Implement the deployment related steps to bring the constructed software in use.

Q6: Read the scenario and answer the below Questions. **[Marks: 05]**

You are tasked with creating a library management system that allows librarians to manage book records using JSP and Servlets. The following operations need to be implemented:

- **Add New Book:** Librarians should be able to add a new book with fields like title, author, genre, and availability status.
- **View All Books:** Display a paginated list of all books in the library database.
- **Search for a Book:** Provide a search bar to find books by title or author.
- **Edit Book Details:** Allow librarians to update book details (e.g., title, author, genre).
- **Delete a Book:** Provide functionality to remove a book from the database.

Question:

1. Design your solution to separate the business logic from the presentation layer (JSP).
2. How would you implement validations (e.g., preventing duplicate entries, ensuring all required fields are filled)?
3. What would you do if multiple users attempt to edit the same book at the same time?

CLO 02: Implement software design patterns as a part of software construction activity

Q7: Read the scenario and answer the below Questions. **[Marks: 05]**

A company needs an Employee Shift Management System built using Spring Boot (MVC). The system must allow administrators to manage employee shifts. The following operations are required:

- **Add a Shift:** Add a new shift with fields like employee name, shift date, start time, and end time.
- **View All Shifts:** Display a list of all shifts, grouped by employee and ordered by date.
- **Update a Shift:** Allow administrators to modify shift details (e.g., change the date or timing).
- **Delete a Shift:** Enable administrators to delete a shift if it's no longer valid.

Question:

1. Each employee cannot have overlapping shifts. Implement logic to ensure **shift timing conflicts are avoided.**
2. Design your solution so that only authenticated administrators can perform these operations.
3. How would you handle cases where multiple administrators attempt to modify shifts simultaneously?
4. Suggest how you would implement validations, error handling, and user-friendly messages for invalid operations.
5. Think about how you would test your application for edge cases, such as shifts spanning across midnight or incorrect time ranges (e.g., start time > end time).

CLO 02: Implement software design patterns as a part of software construction activity.

Q8: Fill in the Blanks: **[Marks: 05]**

1. The _____ acts as the central point for processing all incoming client requests.
2. In Spring Boot, the _____ interface allows seamless integration with the database layer.
3. The _____ annotation in Spring MVC maps HTTP POST requests to handler methods.
4. The _____ class is used to store and pass attributes between the controller and the view in Spring MVC.
5. In Spring Boot, the _____ annotation is used to mark a class as a controller.
6. The _____ layer interacts with the database and handles business logic in the Spring MVC architecture.
7. To iterate over a collection in JSP, the _____ tag from the library is used.
8. The jspDestroy() method is called when _____ of a JSP ends.
9. In JSP, the _____ method is invoked to handle client requests.
10. In JSP, the <% %> tags are used to write _____ code.