Advanced Java Programming

Module 1

1. A) Enumerate and explain three key advantages of using frameworks in enterprise Java application development.

B) Create a Simple Task Management System using the MVC architecture in a Java application. The system should allow users to:

- Add new tasks with a title, description, and due date.
- View a list of all tasks.
- Mark tasks as completed.
- Delete tasks.

C) Analyze how the Model-View-Controller (MVC) architecture contributes to the development process. Discuss three key advantages of utilizing MVC in designing and implementing a Task Management System in Java, highlighting its impact on scalability, maintainability, and code reusability.

2. A) Describe the step-by-step process of how Object Relational Mapping (ORM) works in translating between objects in code and relational database tables.

B) Develop an application for a bookstore inventory management system. The application utilizes an Object-Relational Mapping (ORM) framework to interact with a relational database. The database schema consists of two tables: books and authors. The books table has columns for id, title, price, and author_id, while the authors table has columns for id, name, and country.

C) Analyze the potential performance bottlenecks that might arise when using Object Relational Mapping (ORM) tools like Hibernate in high-traffic, data-intensive applications. Suggest strategies to mitigate these performance issues while ensuring the maintainability and readability of the application codebase.

3. A) Describe the key components of the Hibernate architecture and their roles in facilitating communication between Java applications and databases. How does Hibernate manage the Object-Relational Mapping process?

B) Design and develop an enterprise application that uses Hibernate as the ORM framework. The application has a complex data model with multiple entities and relationships. One of the entities is called "Order" and has a one-to-many relationship with another entity called "OrderItem". Each order can have multiple order items.

- Order entity:
    - Table name: orders
    - Primary key column: id
- OrderItem entity:
    - Table name: order_items
    - Foreign key column referencing order: order_id
    - Price attribute: price

C) Create a Hibernate query (HQL or JPQL) that retrieves all orders along with their total order value from the database.

4. A) Enumerate and explain three crucial benefits of using Maven for dependency management in Java projects.

B) Develop a basic Employee Management System in Java, integrating Maven for project build and dependency management. Implement functionalities like:

- Adding new employees with details such as name, ID, and department.
- Displaying a list of all employees in the system.
- Modifying employee information.
- Removing employees from the records.

C) In what scenarios would it be more efficient to use Hibernate's Criteria API over HQL (Hibernate Query Language) for complex queries in an enterprise-level application? Provide examples and reasoning behind your recommendations for query optimization.

5. A) Describe the concept of branching in Git and explain its significance in version control and collaborative software development.

B) Develop a simple Issue Tracking System in Java, utilizing Git for version control. Implement functionalities such as:

- Creating new issues with details like title, description, and priority.
- Displaying a list of all active issues.
- Updating issue status or details.
- Closing or resolving issues.

C) Assess the importance of utilizing Git, particularly branching, in the development of the Issue Tracking System. Discuss three key advantages of leveraging Git branching in collaborative software development, emphasizing benefits related to parallel work, code isolation, and streamlined collaboration among team members.

6. A) Enumerate and explain three advantages of using design patterns in software development.

B) Develop a basic Online Shopping System in Java following the MVC architecture. Include functionalities like:

- Adding products to a shopping cart.
- Displaying the list of products available for purchase.
- Modifying the quantity of items in the cart.
- Checking out and completing an order.

C) Evaluate the significance of utilizing the Model-View-Controller (MVC) architecture in the development of an Online Shopping System. Discuss three key advantages of employing MVC in designing and implementing this system, emphasizing benefits related to separation of concerns, maintainability, and extensibility of the application.

7. A) Explain what Hibernate Query Language (HQL) is and how it differs from SQL. Provide a sample HQL query and explain how it retrieves data from a database using Hibernate's object-oriented approach.

B) Develop a basic Content Management System (CMS) in Java using Hibernate, incorporating HQL for database interactions. Implement functionalities like:

- Creating new content items such as articles or posts with details like title, author, and content.
- Displaying a list of all available content items.
- Editing or updating existing content.
- Deleting content items.

C) Evaluate the significance of integrating HQL in the development of the Content Management System. Discuss three key advantages of employing HQL for database operations within Hibernate, emphasizing aspects such as dynamic querying capabilities, entity mapping, and improved performance in Java application development.

8 A) Differentiate between Hibernate XML-based and annotation-based Object-Relational mappings. What are the advantages and disadvantages of each approach?

B) Develop a basic E-commerce Platform in Java using Hibernate for database interaction. Implement functionalities such as:

- Adding new products with details like name, description, price, and inventory.
- Displaying a catalog of available products.
- Allowing customers to add products to their cart.
- Managing user orders and checkout process.

C) Compare and contrast the use of Hibernate annotations and XML-based configuration for entity mappings. Analyze the advantages, disadvantages, and scenarios where each approach is more suitable, considering factors such as readability, maintainability, and ease of modification in evolving projects.

9 A) Explain the concept of dependency management and describe how Maven simplifies and enhances dependency handling in Java projects.

B) Develop a simple Banking System in Java, incorporating Maven for project management. Implement functionalities such as:

- Creating new bank accounts with details like account number, holder name, and balance.
- Performing deposits and withdrawals.
- Displaying account information.
- Closing accounts.

C) Assess the significance of leveraging Maven in the development of the Banking System. Discuss three key advantages of utilizing Maven for dependency management, consistent build processes, and facilitating collaboration among developers in Java development.

10. A) Enumerate and explain three key advantages of using version control systems in software development.

B) Develop a basic Ticket Tracking System in Java, incorporating Git for version control. Implement functionalities such as:

- Creating new tickets with details like title, description, and priority.
- Displaying a list of all active tickets.
- Updating ticket status or details.
- Closing or resolving tickets.

C) Discuss how version control systems, such as Git, contribute to the software development process. Explain three key advantages of utilizing version control systems in managing and collaborating on a Book Inventory Management System in Java, emphasizing benefits related to collaboration, traceability, and code management.