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|  | **FINAL EXAM PAPER**  Quarter**: β/**Academic year**: α – γ**  School of Computing and Information Technology. | |
| Course code: **CSE 456** | | Exam code: **01** |
| Course name: **Advanced Java Programming** | | Duration: **90 minutes** |
| Type of Exam: **Closed Book** | | Maximum mark: **100** |

**Instructions:**

* *Non-programming calculator: Yes 🗹 | No 🞎*
* *This paper consists of 3 sections and carries 100 marks.*
* *Section 1 have 2 Questions carries 20 marks, section 2 have 2 Questions carries 25 marks and Section 3 have 6 Questions carries 55 marks*

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1. Database Design and Implementation (Total 20 points)
   1. (15 points) Create Database Schema using Spring Data JPA:
      1. Create a **MySQL database** named, for instance, fmecse456\_studentID using a **code-first approach with Spring Data JPA**.
      2. The database must include the following entities (Java POJOs) with corresponding columns and constraints, to persist and manage data with *Database Schema Tables* as bellow:
         * EquipmentType Table (Loại Thiết Bị)

|  |  |  |
| --- | --- | --- |
| Column Name | Data Type | Constraints |
| equipmentTypeId | INT | PRIMARY KEY, AUTO\_INCREMENT |
| typeName | VARCHAR(100) | NOT NULL, UNIQUE |
| description | VARCHAR(255) | NULL (Optional) |

* + - * Equipment Table (Thiết Bị)

|  |  |  |
| --- | --- | --- |
| Column Name | Data Type | Constraints |
| equipmentId | CHAR(10) | PRIMARY KEY |
| equipmentTypeId | INT | FOREIGN KEY REFERENCES EquipmentType(equipmentTypeId) |
| equipmentName | VARCHAR(150) | NOT NULL, Length 5–100 characters |
| purchasePrice | DECIMAL(10,2) | NOT NULL, ≥ 1000 |
| quantityAvailable | INT | NOT NULL, Between 0–500 |
| purchaseDate | DATETIME | NOT NULL, Default = CURRENT\_TIMESTAMP |

* + - * User Table

|  |  |  |
| --- | --- | --- |
| Column Name | Data Type | Constraints |
| userId | INT | PRIMARY KEY, AUTO\_INCREMENT |
| username | VARCHAR(50) | NOT NULL, UNIQUE |
| password | VARCHAR(255) | NOT NULL |
| role | INT | NOT NULL (Admin=1, Staff=2, Customer=3) |

* 1. (5 points) Insert Data into the Database:
     1. Insert sample data for Category and Product as provided in Sample data.
     2. Insert sample data for the User entity with at least one Admin and one Staff user, consistent with roles specified in table schema.

1. GUI Design using Thymeleaf (Total 25 points)
   1. (10 points) Design Login Page:
      1. The default user interface for your project must be the Login Page, accessible via the URL: http://localhost:8080/login.
      2. Include UI controls for the login function (e.g., username/phone and password input fields, login button).
      3. Screen Properties:
         * Title: StudentName - School Equipment Login
         * Font Family: Arial
         * Font Size (Text): 18px
         * Font Size (Title): 24px
         * Background Color: #F9F9F9
         * Text Color: #333333
   2. (15 points) Equipment Management Page:
      1. Provide CRUD UI controls for **Equipment** (view, add, update, delete).
      2. Must allow:
         * Viewing all equipment
         * Creating new equipment
         * Updating existing equipment
         * Deleting selected equipment
      3. Screen Properties:
         * Title: StudentName - Equipment Management Page
         * Font Family: Arial
         * Font Size (Text): 18px
         * Font Size (Title): 24px
         * Background Color: #F9F9F9
         * Text Color: #333333
2. Implement CRUD Actions with GUI (Total 55 points)
   1. Authentication (10 points)
      1. Login with **Admin/Staff** → save session.
      2. All equipment CRUD actions require authentication.
      3. Unauthorized access → display message: *"You are not authorized to access this function!"*.
   2. List Equipment (10 points)
      1. If authenticated (Admin/Staff), display all equipment.
      2. List must include:  
         equipmentId, equipmentName, purchasePrice, quantityAvailable, purchaseDate, typeName.
   3. Delete Equipment (5 points)
      1. Only **Admin** can delete equipment.
      2. Must include **confirmation step**. Update equipment list after deletion.
   4. Add Equipment (10 points)
      1. Only **Admin** can add equipment.
      2. Validation rules:
         * All fields required (NOT NULL / NOT BLANK).
         * purchasePrice ≥ 1000.
         * quantityAvailable: 0–500.
         * equipmentName: 5–100 characters.
         * purchaseDate set automatically = current date when equipment is inserted.
   5. Question 5. Update Equipment (10 points)
      1. Only **Admin** can update equipment.
      2. Update based on equipmentId.
      3. Same validation rules as **Add**.
   6. Advanced Equipment Listing (10 points)
      1. Only **Admin** can access.
      2. List top **3 equipment items with highest stock per equipment type**.
      3. Display: equipmentName, quantityAvailable, typeName.

------ *End* ------

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|  |  | *Lecturer’s signature*  **Đặng Phạm Hữu Thảo** |