

Design Pattern & Code Smell Analysis – Lab Final Exam

Course: Software Architecture and Design Patterns

Time: 2 hours, **Total Marks:** 100

Project Repository: <https://github.com/pH-7/Simple-Java-Calculator/tree/master>

You are provided with a Java-based calculator application that simulates a calculator. The project includes multiple classes. Although the system runs successfully, it suffers from several **code smells**, **violations of SOLID principles**, and **misuse or absence of design patterns**.

Your task is to analyze the project, identify design issues, and propose meaningful improvements.

You will create a github repository for this exam and on the repository submit a report named report.pdf and refactored given project.

Task 1: Identify Code Smells (20 marks)

Examine the repository and identify **at least three (3)** code smells present in the codebase.

For each:

- Specify the **class/method name** where it occurs.
- Describe **what kind of code smell** it is
- Explain **why** it is a problem.

Task 2: Identify Violated Design Principles/Patterns (50 marks)

Review the code structure and analyze if there is scope to apply a design pattern to make the design cleaner and more maintainable.

If applicable, choose one or more design patterns and refactor the relevant parts of the code.

For each, mention:

- What is the problem/scope you identified and file names of the scope
- The design pattern you are applying
- The refactored file names.

Task 3: Implement a New Feature (Marks 30)

Add one new feature of your choice to the system while following an appropriate design pattern.

Clearly describe:

- What new feature you implemented.
- Which pattern you applied and why.
- Location of your applied feature

Deliverables

Submit the following in via GitHub repository:

1. A short report (PDF or .md) including:
 - Identified code smells
 - Use cases of patterns
 - Addition of a feature
2. Modified/refactored project codes

Fill up the form of you repository name: <https://forms.gle/GnPm8UNFNcoDKfuq9>